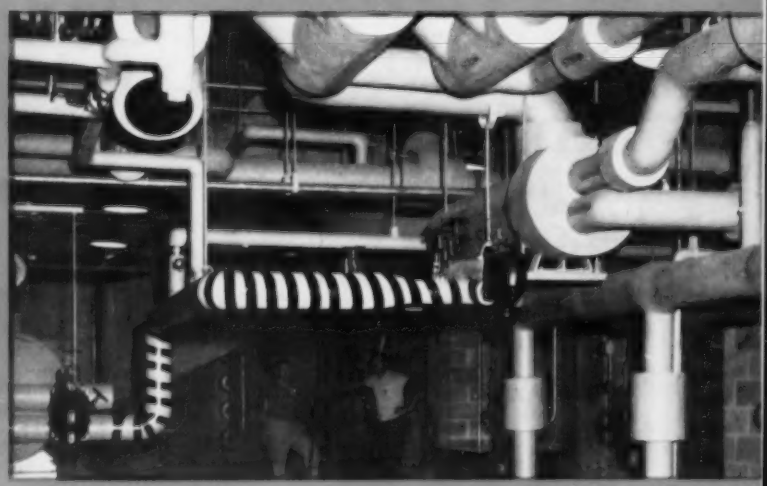
Heating Piping & Air Conditioning

FEBRUARY 1956

Contents .....page 5
Data Sheet ..page 135

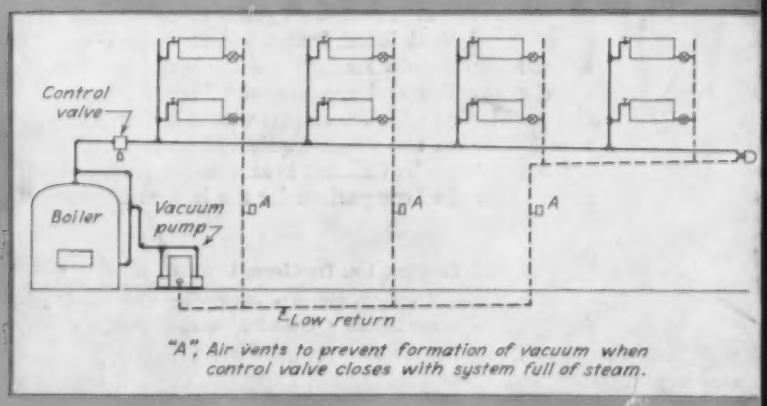
INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Journal Section of the American Society of Heating and Air-Conditioning Engineers—p. 137



Heat exchanger for hot water heating system is one of 16 piping services at industrial atomic lab ....page 102

Canopy hood exhausts smoke into center orifice in tests of four hood types to study exhaust ventilation design .....page 116

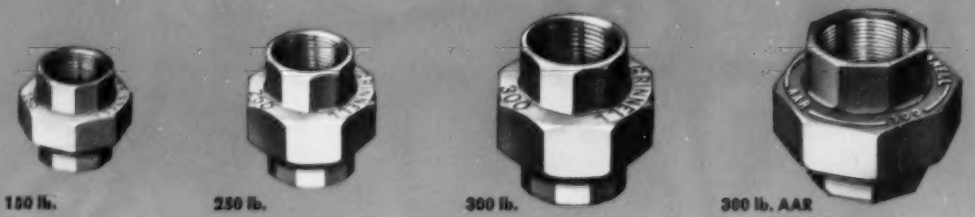


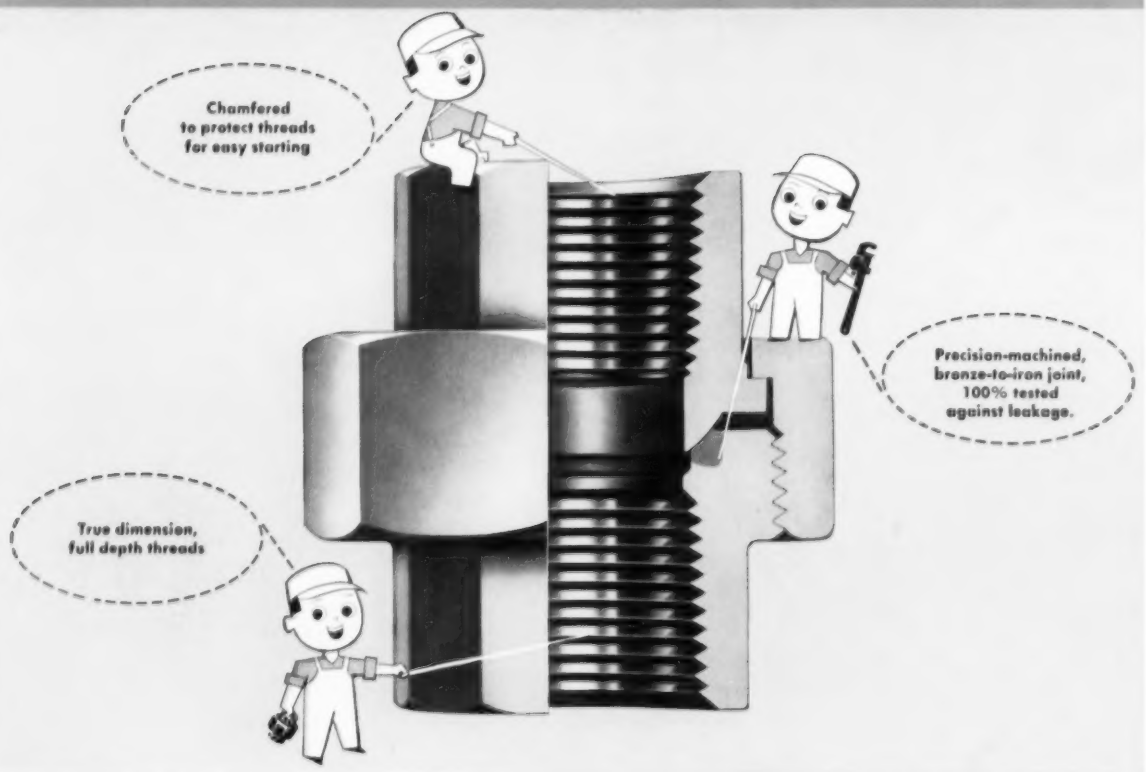
"A", Air vents to prevent formation of vacuum when control valve closes with system full of steam.

Heat control pitfalls such as flooded boilers and return lines and other faults can be avoided or corrected .....page 98

Save time on the job . . . avoid customer gripes after the job, with

GRINNELL bronze-to-iron UNIONS




Chamfered to protect threads for easy starting
Precision-machined, bronze-to-iron joint, 100% tested against leakage.
True dimension, full depth threads

In the Grinnell Union, there's strength . . . *rugged, built-in strength!* A superior grade of malleable iron is used in Grinnell bronze-to-iron unions — followed by careful manufacture and frequent quality checks. The end result is the high quality Grinnell Union which must pass the final air pressure inspection test under liquid before it is accepted. No wonder Grinnell bronze-to-iron unions are a standard of comparison for the industry.

Quality Grinnell bronze-to-iron unions feature:

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- 100% tested with air under liquid
- Bronze ring inserts of improved design
- True dimension, full depth threads
- Chamfered to protect threads for easy starting

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TO THE RESCUE...

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One of the largest integrated air conditioning systems ever installed using factory-assembled packaged central station equipment is in operation at the Piasecki Helicopter Corporation plant in Morton, Penn.

The conditioned area comprises approximately 70,000 square feet, divided into three large areas accommodating the plant's tool design, tool and equipment control, purchasing, accounting, engineering, drafting, cafeteria and reproduction departments.

Each usAIRco RK unit contains, in a single casing, all the elements of a central station packaged air conditioning plant, including built-in evaporative condenser for water recirculation.

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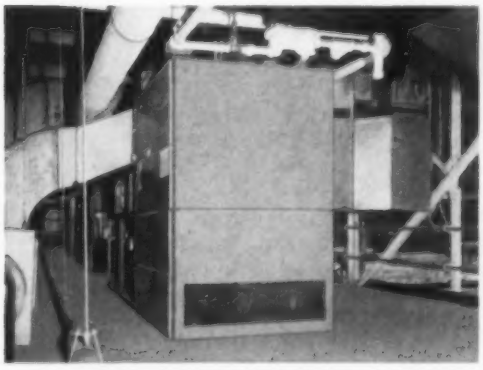
The system was designed by Charles S. Leopold, consulting engineer for the Piasecki Corporation, which was represented by W. F. Swartz, plant engineer, and J. E. Weber, plant facilities supervisor. The usAIRco representative is Malloy & Company, Paoli, Pennsylvania.



On a specially constructed concrete platform supported by steel gridwork are 7 usAIRco RK units. Conditioned air goes through wall, left, to ductwork above suspended ceiling in adjoining area.

Three usAIRco RK units are mounted in roof penthouses, shown here during construction. Supply air is delivered to nearby conditioned area through ducts. Units operate all year, with tempering through use of finned heating coils in branch ducts.

For further details, write C. N. Hawkinson

UNITED STATES AIR CONDITIONING CORPORATION

Minneapolis 14, Minnesota • Export Dept.: 13 E. 40th St., New York 16, N. Y., U. S. A.

usAIRco
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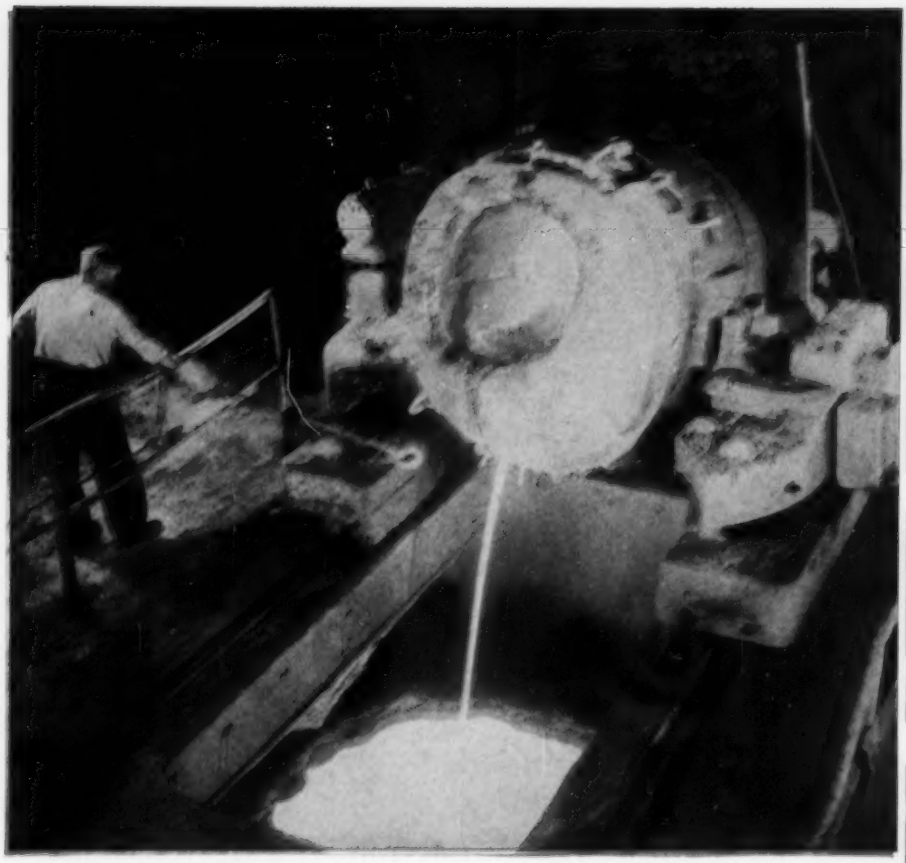

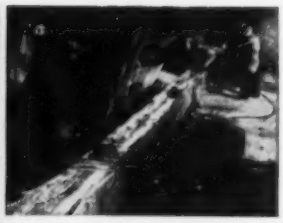

Melting pig iron in the cupolas

Purifying iron in bessemer

An exact iron silicate is tapped

"Sponge ball" goes to the press

This exclusive 5-minute operation gives WROUGHT IRON built-in protection against corrosion

The pig iron has been melted in the cupolas . . . purified by the bessemer converter. An exact iron silicate has been readied in special rotary furnaces and moved by ladle beneath the machine holding the highly refined, molten iron . . . everything is ready for the key step.

The signal is given. The processing machine tips its ladle forward. Molten refined iron flows at a controlled, predetermined rate into the ladle holding the melted silicate. This operation is shown above. The falling iron stream penetrates into the silicate, then separates into droplets. Liberated gas from within bursts apart the solidifying droplets. The shattered fragments settle continuously to form a "spongy mass"—welding hot—in the molten silicate.

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ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 28 No. 2

(with which is merged the Aerologist)

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Published monthly by the Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill. Telephone: STate 2-6916. Subscriptions: U.S. and possessions, $3.00 per year; Canada, Cuba, Mexico, Central America, South America, $4.00 per year; other, $6.00. Current copies, U.S. and possessions, 35c each; back copies, 60c each. January 1956 issue $1.50 per copy. For change of address, notify publisher and your local postoffice of both old and new addresses by the 8th of the preceding month. Member Audit Bureau of Circulations, Associated Business Publications, Inc., and Magazine Publishers Association, Inc. Heating, Piping & Air Conditioning is indexed regularly by Engineering Index, Inc., and Industrial Arts Index and is microfilmed by University Microfilms.

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Entered as Second Class Matter May 18, 1929 at the Post Office at Chicago, Ill., U.S.A. under the Act of March 3, 1879. Additional entry at Mendota, Ill.

Features

Air Conditioning Solves Decal Printing Problems 95
William H. Junker

How To Avoid Pitfalls of Heat Control 98
Lewis Smith

Piping Performs 16 Services in Industrial Atomic Laboratory 102
R. W. Ulm, W. J. Hamer, L. H. Rogers, and G. P. Rutledge

Stephen Hales: 18th Century Ventilation Authority 106
Howard C. Murphy

How To Read Faster and Better 108
Nila B. Smith

How System Head Curve Helps Select Boilerfeed Pumps 110
Thomas F. Keating

$21 Million Mental Hospital Gets Steam Service, Air Conditioning 113
Alex Kay

Tests of Four Exhaust Hoods Provide Design Data 116
Arnet B. Epple

How Faulty Refrigerant Piping Can Be Corrected 120
C. T. Baker

400 Ton Multiple Package System Air Conditions Jet Design Offices 122
James A. Lamb

Question of the Month 125
How can I heat monitor building?

On the Job 128
Roundup of recent heating, piping, and air conditioning jobs

How To Figure Net Positive Suction Head 130
J. A. Cable

Sam Lewis' Page 132
Converters replace tubes-in-boilers to heat water

Air Condition Existing Hotel with Individual Ceiling Units 133
Louis L. Hamig

The Law and Your Profits 134
Two names didn't increase profits for subcontractor

Data Sheet 135
How to avoid fan platform vibration

ASHAE Journal Section

Air Velocities in Two Parallel Ventilating Jets 137
Alfred Koestel and J. B. Austin, Jr.

Comparative Performance of Indirect Water Heaters 141
L. L. Hill and W. S. Harris

Heat Requirements of Snow Melting Systems 149
W. P. Chapman and Samuel Katunich

1955 Annual Report of Committee on Research 154

The Heat Pump 160
E. P. Palmatier

Summary of Chapter Meetings 161

Candidates for Membership 165

Officers, Council and Committees 166

Departments

The Editors' Pages 83

"Open for Discussion" 87

Equipment Developments 175

Recent Trade Literature 212

Who's What 228

We Hear That 244

Meetings and Conventions 254

New Books and Reports 258

Index to Advertisers 262

How a Contractor Can Cut Costs By Using Armstrong Steam Traps

● There is more than meets the eye in steam traps. If you don't regularly specify Armstrongs, you ought to know about these cost factors:

1. First Cost. The size and, hence, price of a trap is determined by its capacity. The high capacity of each Armstrong trap often enables you to select a size smaller than you would otherwise use.

2. Installation Cost.

Connections. Armstrong offers you a choice of straight-through horizontal or vertical connections, as well as a right angle trap, to save fittings and labor.

Strainers—seldom needed because ordinary dirt and scale won't plug up an Armstrong. When strainers are desirable, Armstrong offers built-in strainer traps that cost less to buy and install than separate traps and strainers.

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3. Call-Back Cost. When you put in Armstrong traps, the job is done. The traps will work without attention, not just for a month or two or even a year, but *more commonly 3 or 4 or 5 years!* No traps have so enviable a record for low maintenance as Armstrongs because the mechanisms in low pressure traps are identical in design, workmanship and materials to those used in traps for 900 lbs. pressure, 900°F temperature.

Get the figures and the facts. Call your local factory-trained Armstrong Representative or write:

ARMSTRONG MACHINE WORKS
874 MAPLE ST., THREE RIVERS, MICHIGAN

How to Select and Install Steam Traps for Lowest Cost:

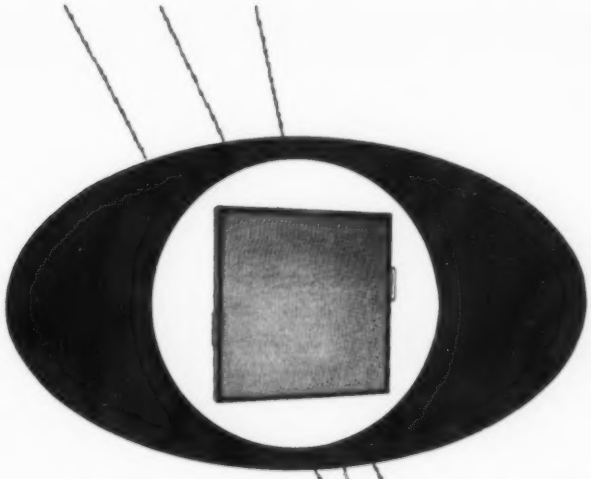
Here are two pieces of useful literature you should have—free on request:

1. Armstrong Steam Trap Book—44 pages of trap data, tables, hookup diagrams and selection information.

2. Unit Heater Trapping—trap selection and installation plus BTU output tables for every model of 30 makes of unit heaters.

UNCONDITIONALLY GUARANTEED TO SATISFY THE USER — APPLICATION ENGINEERED

ARMSTRONG STEAM TRAPS



NOW—
you can be sure you are right

Because most filters are efficient at cleaning air, you are reasonably sure of getting a satisfactory job when you install an established make. The service life of your expensive air conditioning machinery and the comfort of your building depend on the ability of relatively low cost filters to do their job.

FARR Company, as one of the country's leading filter manufacturers, wants to insure that your are getting the most value out of your present filters, regardless of make. Therefore, they will send a field engineer who is an air filtration expert, to carefully analyze your air filters and submit a factual, written report like the one shown, on his findings. Often he can make suggestions that will greatly increase your filtration efficiency and save a substantial amount of money in operating costs.

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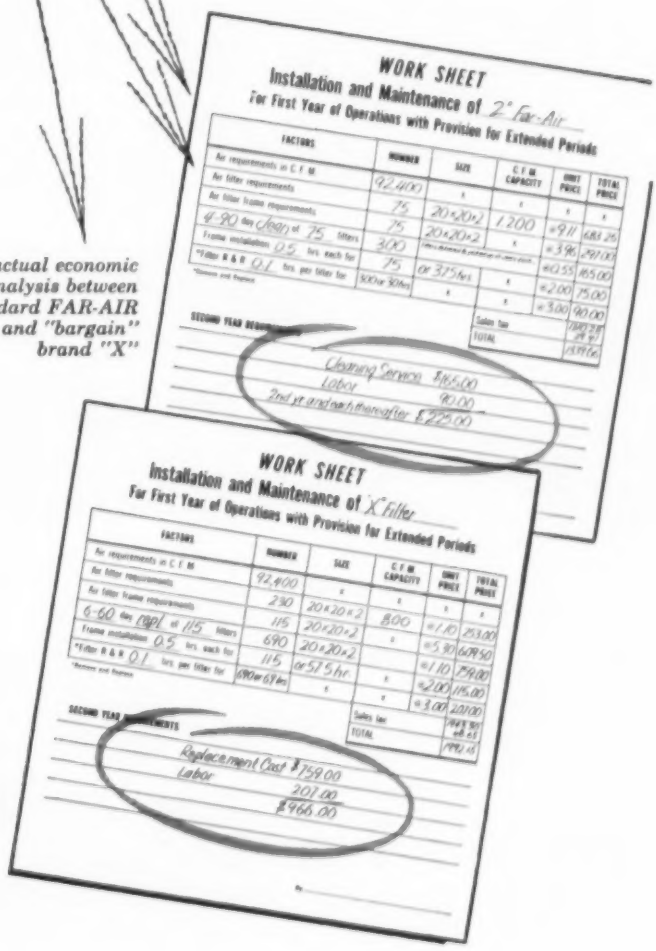
Why not try this service? It is factual, honest and subject to favorable comparison by any reputable manufacturer. Write today to Farr Company, P.O. Box 45187, Airport Station, Los Angeles 45, Calif.

An actual economic analysis between standard FAR-AIR filters and "bargain" brand "X"



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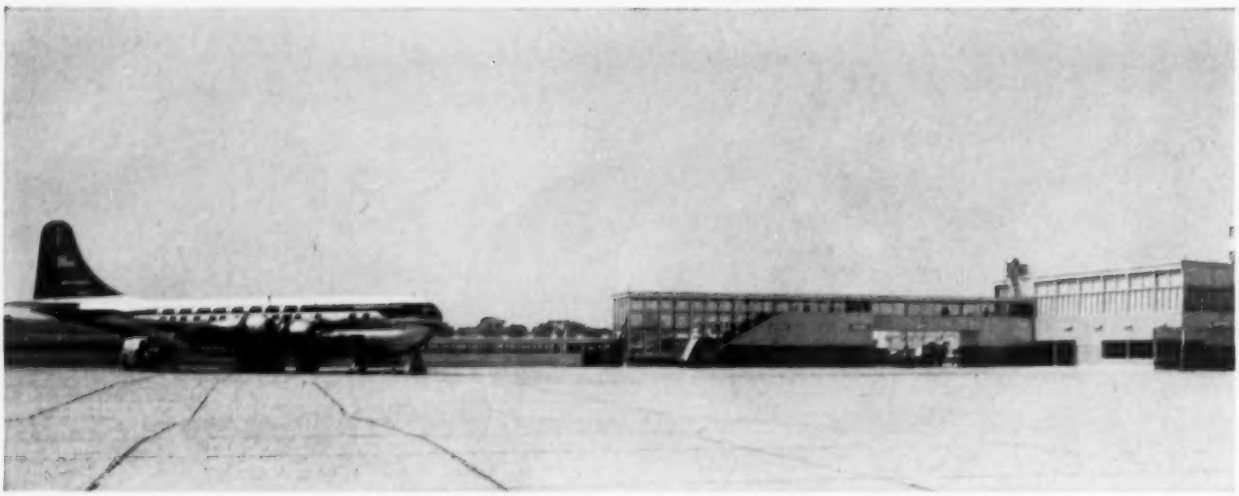


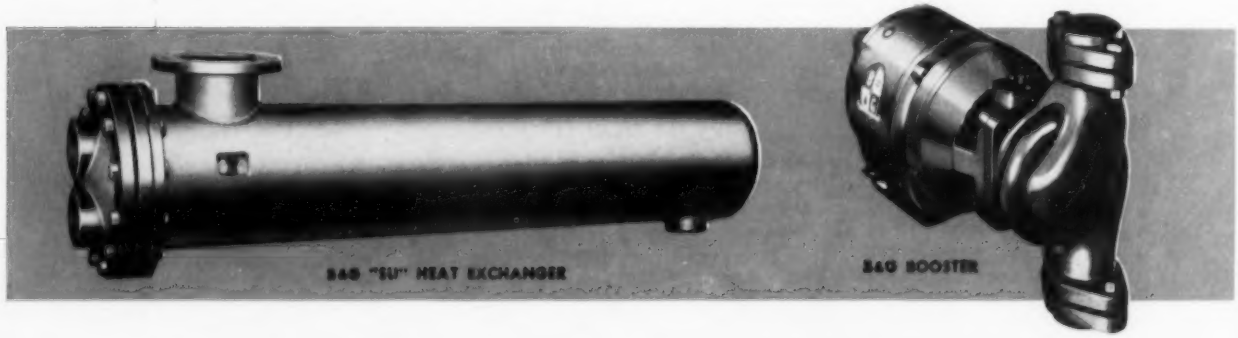
In new airport, B&G Hydro-Flo *circulates water for space heating and*

At the new Milwaukee County Airport Terminal, mechanically circulated hot water is used to provide comfort for travelers and operating safety.

For space heating, water heated in B&G Steam Convertors is circulated through the system by B&G Booster pumps located at the convertor stations. The ticket and baggage concourses and part of the second floor employ radiant panels. Anti-freeze solution for the snow melting panels is heated and circulated by similar B&G equipment.

Hot water for service use is also heated in a B&G Steam Convertor and circulated through the system by a B&G Booster.

B&G circulating pumps are specifically designed to meet the exacting requirements of a satisfactory water system...*for either heating or*



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The "SU" Heat Exchanger is an instantaneous type, designed to heat liquids with steam. No space-wasting, expensive storage tank needed. "SU" Exchangers are available with either 2 or 4 passes and cast iron or brass construction. Common applications include heating of service water, radiation, storage tanks, swimming pools and feed-water.

B&G Booster Pumps

Basically sound engineering, supported by precision manufacture, is the reason why the B&G Booster can show such a remarkable record for efficiency, dependability and long life. *Over 2,000,000 B&G Boosters have been sold to date!*

These pumps satisfy the all important requirement of *quiet operation*. Motors are either built in the B&G plant or to rigid specifications by leading motor manufacturers. The oversized shaft is of a special alloy...bronze, *sleeve-type* bearings, extra long to maintain the shaft in exact alignment and assure smooth operation. Add to this a leak-proof seal—positive protection against entry of water into the bearings.

B&G Boosters are easily serviced. By removing a few bolts, the pump can be separated into three parts, permitting servicing without breaking pipe connections.

For pumping jobs having greater head and capacity requirements than covered by Boosters, the B&G Universal Pump offers the same *quiet*, dependable performance.

equipment heats and snow melting

cooling. And for the many applications where steam-to-water or water-to-water heat transfer is required, B&G Heat Exchangers provide large capacity in compact, efficient units.

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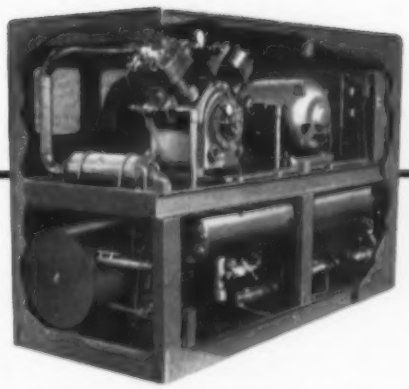

B&G PACKAGE LIQUID COOLERS

Virtually a plug-in unit for a wide variety of applications...as a separate space cooler...or in combination with a forced hot water heating system...or for industrial processes requiring controlled cooling of materials. Available in capacities from 7½ to 100 tons.

Numerous features make the B&G Package Cooler an outstanding unit. Low pressure drop through the evaporator permits a substantial reduction in system pump sizes. The evaporator is located under the compressor for a lower center of gravity—making the unit easier to install and service. An integrated electrical control system provides a high degree of automation without extra cost. Completely wired, including chiller and tower pump.

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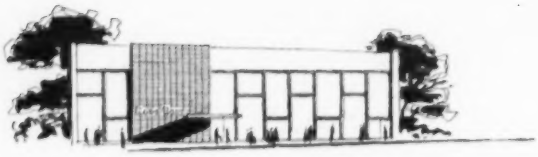
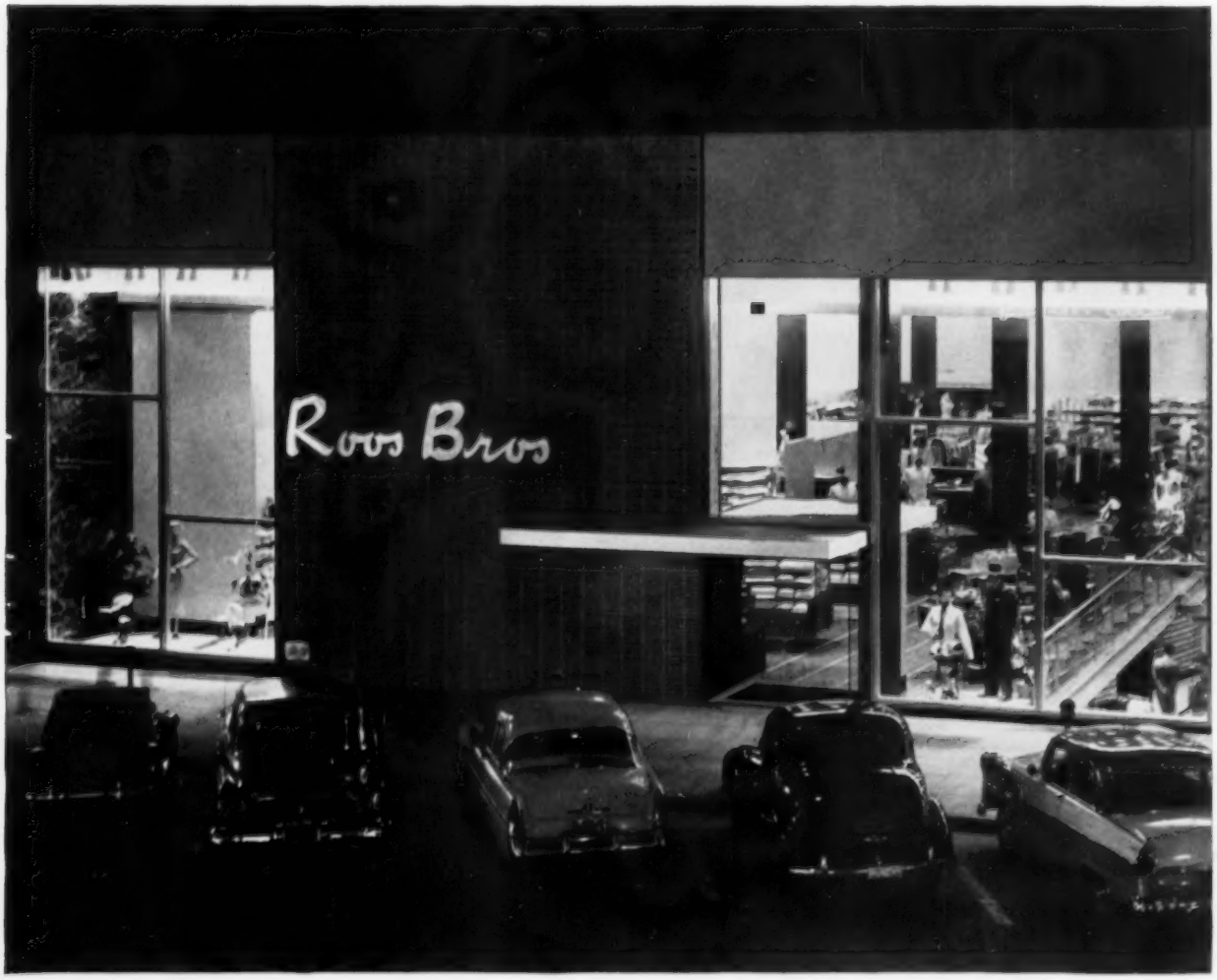


Comfort story of a modern apparel shop

How Honeywell Electronics makes Air Conditioning



Roos Bros. clothing store, San Mateo, Calif. Architect representing Roos Bros.: Welton Becket, F.A.I.A., & Associates (San Francisco office). Architect-engineer representing Parrott Investment Co.: W. P. Day, San Francisco. Air Conditioning contractor: York Corp. (San Francisco office).

Dramatic three-level plan of Roos Bros. store provides maximum floor area with no feel of crowding.

Major advantages of its Honeywell Electronic Customized Temperature Control system are:

. . . ***big savings on cooling*** — outside air is used automatically to help cool the store, cutting costs of mechanical refrigeration.

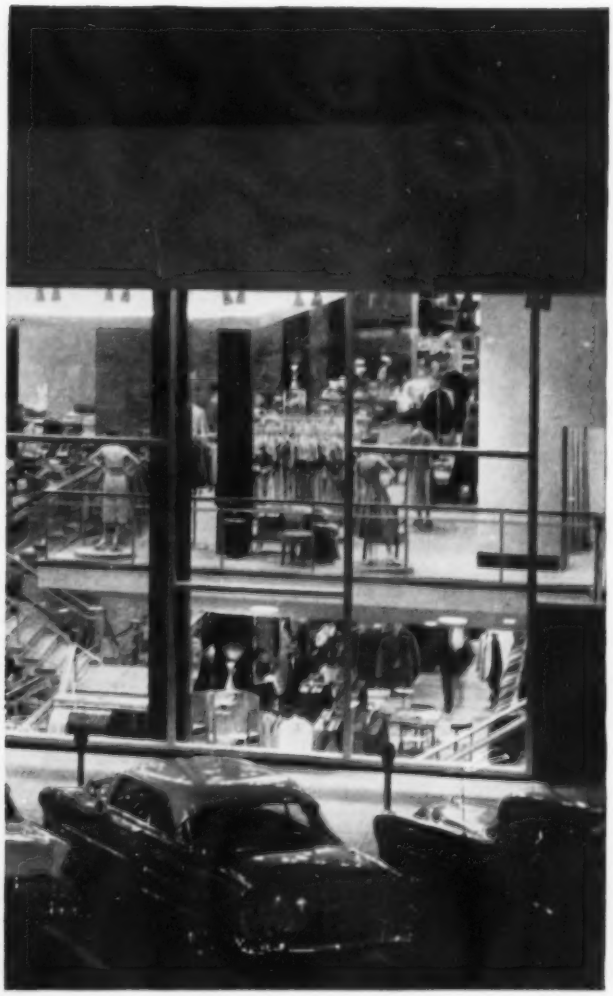
. . . ***from heating to ventilating to cooling,*** comfort is controlled automatically by a single thermostat.

. . . ***an outdoor thermostat*** anticipates weather changes winter and summer, prevents air-cooling shock and winter chill.

. . . ***system on-off switches*** are conveniently located right in the manager's office.

Added up, these features mean maximum comfort with maximum convenience, efficiency and economy.

Systems work better for less money



Now you can give any client ideal comfort, big-system conveniences at lowest cost — with Honeywell Electronic Temperature Control

A few years ago, stores like this one — a smart new Roos Bros. apparel shop in San Mateo, Calif. — had to make do with second-rate indoor comfort.

Why? Because good air conditioning performance depends on good control. And it took the recent development of Honeywell Electronics to make the *best* air conditioning control economically feasible for installations of moderate size.

Before electronics, for example, smaller installations for which a pneumatic system was too expensive had to depend on electric controls — fine for certain applications, but lacking flexibility for meeting varying load requirements of a retail store.

Having acted on wise analysis and guidance in their choice of a control system, Roos Bros. management enjoys many big-system benefits from the store's heating-cooling plant — benefits that only Honeywell Electronic Customized Temperature Control can provide at sensible cost. Explained briefly above, they result in an ideally comfortable shopping environment in which customers are likely to stay longer, buy more.

These benefits suggest some of the ways Honeywell Electronics can help you give your clients unprecedented comfort, convenience, economy — in heating, ventilating, air conditioning and industrial control, in any building, new or existing.

Call your Honeywell office for a new booklet that tells more fully how to apply electronics to your clients' control problems — and for information on the economical Periodic Maintenance Plan. Or write Honeywell, Dept. HA-2-11, Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

Electronic Controls

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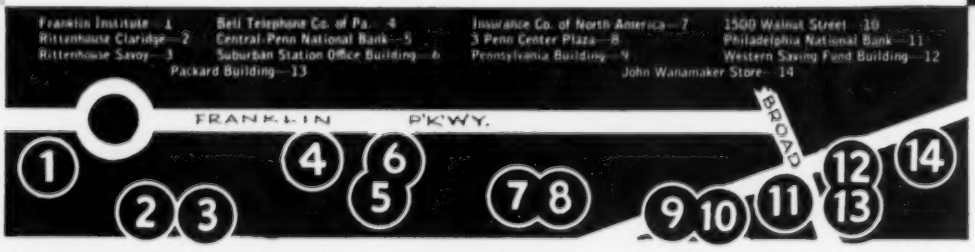
MAGNIFICENT PENN CENTER

—where nearly a score of buildings demonstrate a "new concept" of air conditioning with Yorkaire Systems!

Exciting 3 Penn Center Plaza
—the first new office building to be erected in Philadelphia's fabulous Penn Center redevelopment area!



Now 30—three more hotels have chosen York!

York brought the right kind of air conditioning *to the Empire State Building, Cincinnati's Netherland Plaza Hotel and to 27 of Miami Beach's largest, newest hotels. Denver's new Mile High Center, San Francisco's new Equitable Life Assurance Society Building and the striking new Colgate-Palmolive Building in New York have Yorkaire Systems, too. Famous York companions to 3 Penn Center Plaza are shown on the map above.*

Also the Connecticut General Life Insurance Co., the Congress Hotel, Rockefeller Center, Inc., the Ford Motor Co. and Atlanta's Fulton National Bank!

↑ Add Lumbermen's Mutual Insurance Co., Atlantic Refining Co., etc.

York refrigeration air conditioning

the quality name in

YORK CORPORATION HEADQUARTERS FOR

JDS — this is a swell ad, but can't we include the other jobs I've listed? — L.Q.

Superb new 3 Penn Center Plaza features two compact 800-hp. York Turbo Water Cooling Systems located in the basement. They provide the cooling for 1200 Model CF Yorkaire Conditioners in the individual rooms.

The ability to meet rigid specifications, to bring the *right kind* of air conditioning to a building—and to do it all at a reasonable price—appeals strongly to our first-time customers. They call it a "new concept" of air conditioning.

This concept is dramatically illustrated in the Penn Center area. As in all large buildings, heat loads and glass areas and floor areas and numbers of occupants . . . economic considerations, taxes, depreciation and a score of other factors varied from building to building all around the Center. Obviously, no one system—or even two or three—could air condition all these buildings best. That's why York carefully selected and then precision-engineered each Yorkaire System to fit the air conditioning needs of the particular building in which it is installed.

Your building can have the right kind of air conditioning, too. Call your York District Office (listed in the classified phone directory). Or write directly to York Corporation, York, Pennsylvania.

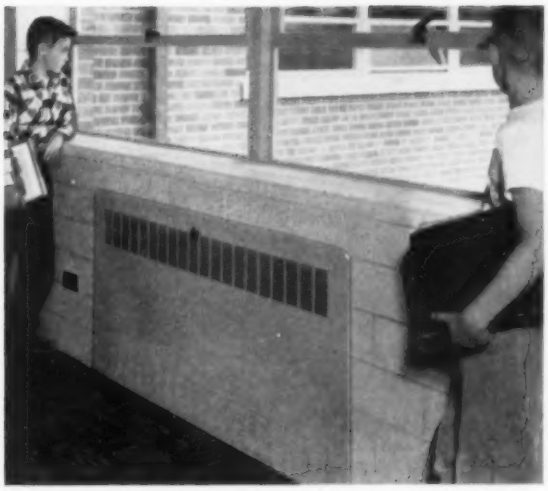
air conditioning and refrigeration

MECHANICAL COOLING SINCE 1885

Dunham Flat Top Fin-Vector Radiation used in a modern country club along weather-exposed walls, in long runs that keep dining rooms and club rooms warm and comfortable.

Just name what you want in radiation

...then depend on DUNHAM



Dunham Recessed Convector controls corridor temperature in a modern school, saves premium passageway space. Tamper-proof models available.

Dunham Sloping Top Fin-Vector extending full length of school-room under windows, eliminates chilling effects of downdrafts.

Dunham Baseboard Radiation in recreation room provides even temperatures from floor to ceiling, does away with drafty floors, fits flush to floor to simplify "cleaning under" problem.

Dunham Thermo Vector Radiation, painted to simulate wood paneling in modern office building, runs full length along outside walls, minimizes wall streakage.

When you depend on Dunham for radiation, all you need do is to *name* the type of radiation your particular installation calls for . . . and you get it. For Dunham has everything you want for any job.

Five complete lines to choose from: 2 lines of Baseboard for residential and commercial markets, Convectors 18″ to 112″ in length including picture window and institutional types, Finned Tube radiation including 3 types of FIN-VECTOR® and the amazingly versatile, front outlet THERMO VECTOR®. All install in less time . . . and with less trouble.

Depend on Dunham and you get *everything* you need in radiation from one source AND place full responsibility for your equipment's performance on one manufacturer —Dunham. For full information, write for Bulletin HPAC-2. C. A. Dunham Company, 400 W. Madison Street, Chicago 6, Illinois.

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HEATING & COOLING EQUIPMENT

RADIATION • CONTROLS • UNIT HEATERS • PUMPS • SPECIALTIES

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Now...General Controls offers the famous

Stack-Mounted Series 5200 and 5520

For constant or intermittent ignition on pressure or rotary type burners. Available in either non-recycling or recycling models. Easy to install—no leveling needed. Safety or ignition switch unaffected by ambients or motor loads. Durable flame safety.

Don't settle for less than the features that make PERFEX best!

- **BROAD, FLEXIBLE LINE**...continuous or intermittent ignition...stack or burner-mounted safeties...non-recycling or recycling models.
- **DURABLE FLAME DETECTOR ELEMENT**...high quality thermo-expansion design far superior to simple bimetals.
- **FAIL-SAFE DESIGN**...for dependability that assures "like new" performance for many years.
- **FEWER CONTACTS**...generously sized for longer life and trouble-free service. Powerful contact pressure to insure positive operation.
- **RUGGED CONSTRUCTION**...for sustained efficiency in spite of high ambients and fluctuating loads.

✻ ***Flame detectors interchangeable***

Plus this outstanding addition to the line

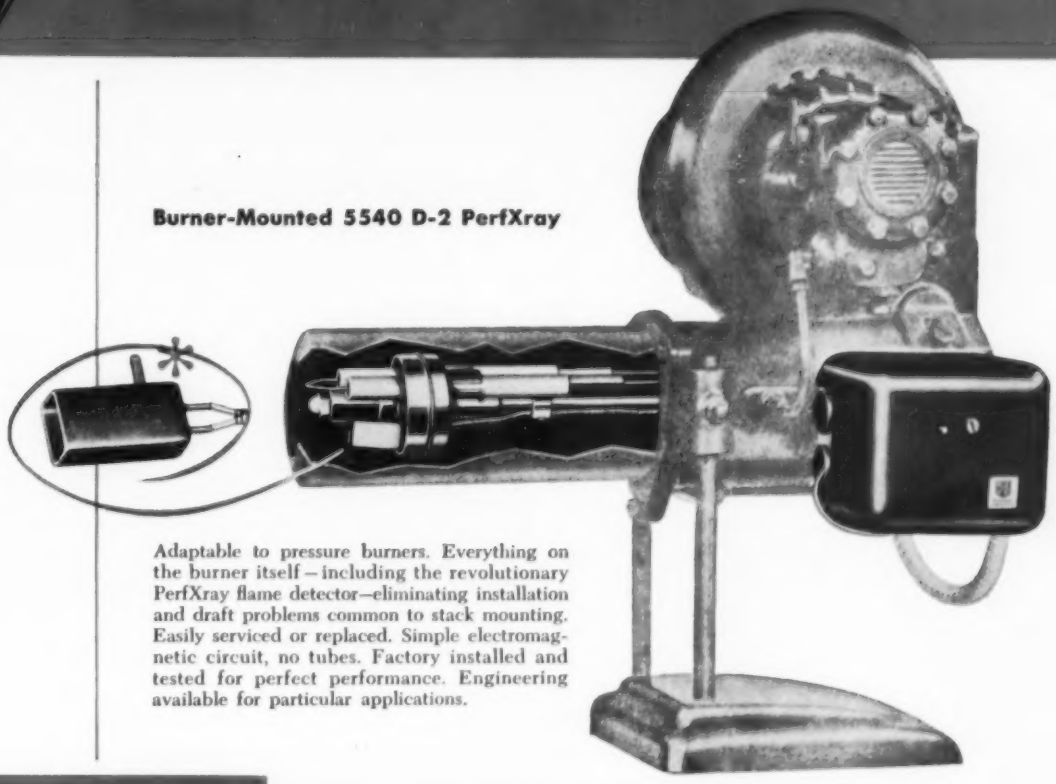
Two-Piece Stack/Burner-Mounted Series 5550

Giving you complete flexibility in stack-mounting. Sturdy sensing element installs easily in any stack location, primary relay mounts on burner itself for ideal accessibility. This important installation and maintenance advantage is in addition to all the outstanding design and construction qualities long associated with Perfex primaries—rugged simplicity for long life, generously sized contacts, operating efficiency unimpaired by age, ambients or fluctuating motor loads.

It's good business to look into General Controls' complete line of limit controls and slim silhouette room thermostats. Standard, air conditioning and clock models available.

Perfex Primaries

Burner-Mounted 5540 D-2 PerfXray



Adaptable to pressure burners. Everything on the burner itself—including the revolutionary PerfXray flame detector—eliminating installation and draft problems common to stack mounting. Easily serviced or replaced. Simple electromagnetic circuit, no tubes. Factory installed and tested for perfect performance. Engineering available for particular applications.

General Controls'
famous
Perfex
Primaries

And now...this performance-proved line is backed by General Controls famed field service organization

5 plants geared to produce top quality in high volume to satisfy your production schedules.

7 regional warehouses strategically located to meet your emergency needs with immediate delivery.

40 branch offices placing top-caliber control counsel and assistance near at hand at all times.

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Manufacturers of Automatic Controls for Home, Industry, and the Military

FORTY BRANCH OFFICES SERVING THE UNITED STATES AND CANADA

PERFEX CONTROLS AND GENERAL CONTROLS

You don't have to apply a separate vapor barrier with this duct insulation

Where condensation is a problem, economize by using Armstrong Armaglas* Vapor-Seal Duct Insulation. This glass-fiber, board-form material comes with a factory-applied vapor barrier of asphalt-impregnated kraft paper. On cool air ducts, it saves you time and money by eliminating the need for separate vapor barrier application. Big 24" x 48" boards go up quickly. Joints and any breaks in the barrier are sealed for a tight job. Outdoors, a weatherproof finish should be applied.

Armaglas Vapor-Seal Duct Insulation is one of the quality products in the complete line of Armstrong Industrial Insulations. Armstrong also offers you a complete contracting service, geared to install these products economically and efficiently. Send for free booklet containing complete information on Armaglas Vapor-Seal Duct Insulation. Booklets on other Armstrong insulations also available on request. Check the coupon below today.

* Trade-Mark. Manufactured for Armstrong by Owens-Corning Fiberglas Corp.

Armstrong

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Armstrong Armaglas Duct Insulations in blanket and batt types

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*TRADE-MARK

Now

"Budget-Priced" CORROSION PROTECTION

for the Small to Medium Steam Plant

The New

SCHAUB "03" *Deaerator*

- ***Combats "Return Line" Corrosion***
- ***Simpler in Principle***
- ***Gives Positive Oxygen Removal to .03 CC/Liter***

It is in plants of 3,000 to 30,000 lbs/hr boiler capacity — often operating at low pressure — that "return line" corrosion is most apt to rear its ugly head. This happens even when raw water make-up is negligible.

The Schaub .03 Deaerator was designed especially for these plants. It offers an effective and economical way to "clean up" boiler feedwater that will pay for itself many times over. It is equally applicable to high pressure installations.

The *big* difference in the Schaub .03 Deaerator is that it operates fully vented at *atmospheric* pressure. Noncondensible gases escape *immediately* and *completely*. Premium cost construction is eliminated, maintenance and operating costs are reduced to a minimum. Simple but effective spray-contact vent condensing prevents wasteful steam vapor loss. Pin-point temperature control, "live action" heating, and rust proof Chromasoid lining are exclusive features.

FRED H. SCHAUB ENGINEERING COMPANY

2116 South Marshall Boulevard • Chicago 23, Illinois

Write for Bulletin 1300 — and the full story on this low-cost, more efficient Deaerator.

Simple as it is, there's a lot more to the Schaub .03 Deaerator than can be told on this page. Bulletin 1300 is filled with facts for the operating or consulting engineer responsible for boiler feedwater deaeration. It tells the "hows" and "whys", and the basic differences in the Schaub .03 method. Mail the coupon now. No obligation, of course.

NOTE: The Schaub .03 Deaerator is designed for boilers up to 1,000 HP. or 30,000 lbs. per hour. For capacities up to 100,000 lbs. per hour at .005 cc/liter "zero-oxygen" removal, write for Bulletin 575, describing the Schaub Zero-Oxygen Deaerator.

FRED H. SCHAUB ENGINEERING COMPANY
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Please send me, without cost or obligation, my personal copy of your new Bulletin 1300 on Boiler Feedwater Deaeration.

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RESEARCH KEEPS **B.F. Goodrich** FIRST IN RUBBER

How Cell-Tite® solves 2 miles of condensation problems

Supplied in 50 foot rolls, tubing can be custom cut for the job, eliminating waste and reducing costs.

Flexible Cell-Tite tubing is ideal for short, sharp curves of copper tubing. Except for modernizing existing installations, piecing or gluing is unnecessary.

AFTER a recent air conditioning installation that required over 11,000 feet of Spongex Cell-Tite tubing, Mr. Charles Ross, President, Economy Plumbing & Heating Co., Chicago, said:

"Spongex Molded Cell-Tite is in a class by itself as an insulation material on flexible copper tubing. It certainly has solved a long-standing problem. We'd tried everything in the past; some were too slow and sloppy, others too bulky and rigid, and still others were supplied only in 3-foot lengths.

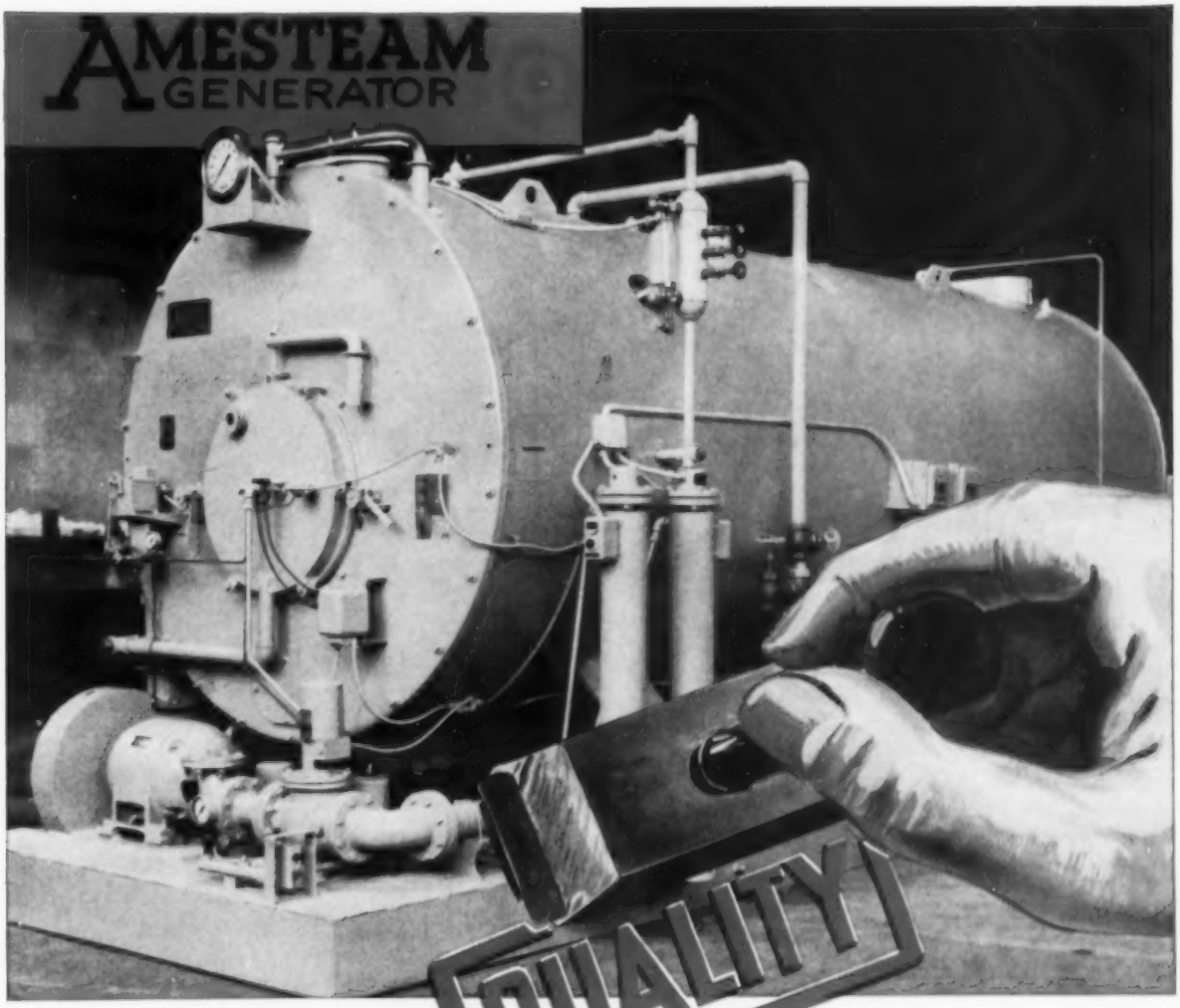
"With Cell-Tite, cutting the tubing to length is no problem at all. We simply use ordinary scissors. We don't have any messy gluing problem. Actually, the most inexperienced workmen can slip this material around a coupling, and achieve a tight fit."

Spongex Cell-Tite is durable rubber with millions of non-interconnecting cells, each acting as a separate insulator. This means Cell-Tite tubing not only protects against moisture condensation in the summer, but also withstands the high temperatures of winter heating.

As tubing, Spongex Cell-Tite is made with standard outside diameters of ¾", 1", 1¼", 1½", and can be made 1⅛", 1¾" and 2". Almost any inside diameter is available up to ¼" of the outside diameter in lengths up to fifty feet.

For more technical information write B. F. Goodrich Sponge Products Division, 281 Derby Place, Shelton, Conn.

B.F. Goodrich
SPONGE PRODUCTS DIVISION



It takes a QUALITY Boiler to produce LOW COST STEAM

. . . and isn't low-cost steam what you're actually after in a boiler? There's only one way to get it — with a boiler of proven high quality.

Ames Iron Works has been building such boilers for 108 years, putting into them the engineering, material and workmanship necessary to give the best possible service to the customer.

Today's AMESTEAM GENERATOR, with its simple, efficient, 3-pass design, embodies the best of those 108 years — the latest developments which we know are practical. And the number of customers ordering their 2nd, 3rd, 4th, 5th and more AMESTEAM GENERATORS justifies the painstaking care that goes into these units.

For a quality boiler that's bound to give you overall steam economy — plus the well-known AMES 24-hour service — specify AMESTEAM GENERATOR — 20 sizes, 10 to 600 h. p. 15 to 200# Oil, Gas or Oil-Gas Combination . . . *Mail coupon today.*

AMES IRON WORKS

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Please send me further information on AMESTEAM GENERATORS and name of the nearest representative.

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●Look under "The Youngstown Sheet and Tube Company" in one of these alphabetical or classified phone books.

They represent the 28 conveniently located district sales offices Youngstown maintains across the country. Offices staffed by men who are specialists in steel and who know pipe. They understand **your** problems and are qualified to help you get the pipe you need.

If you aren't in touch now with a Youngstown pipe distributor, just call the Youngstown district office nearest you and we will help you solve your pipe problems.

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THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

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ALCO THERMO VALVES

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breaking connections

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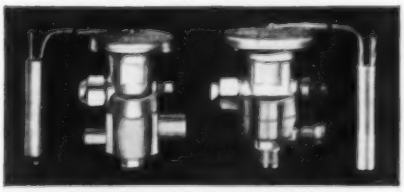

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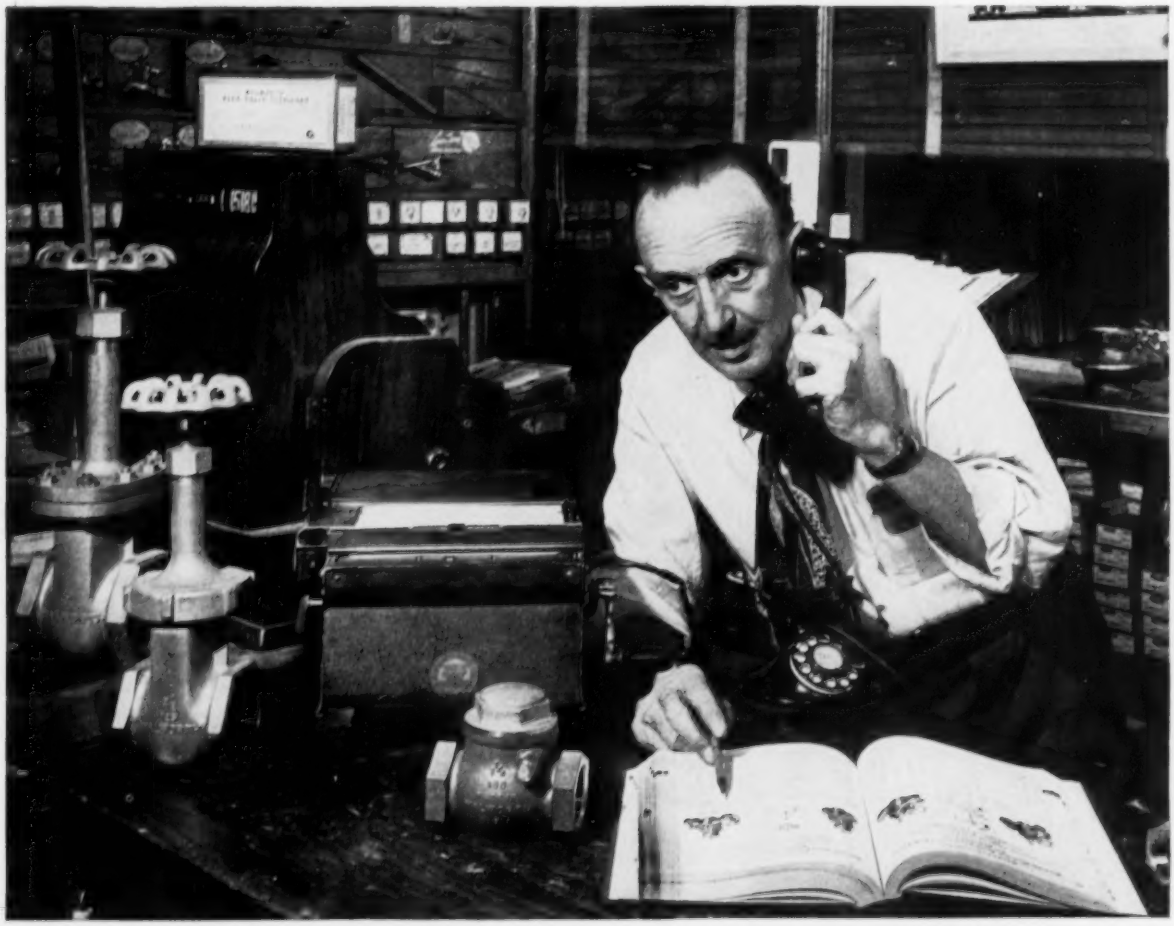

*Fictitious name used to typify over 400 Walworth Distributors

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Andy Hansen is typical of Walworth Distributors throughout the nation. He has been a distributor of Walworth Valves and Fittings for years. Like Andy, the Walworth Distributor in your area provides these services and savings:

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YOUR SYSTEM CAN PERFORM ONLY AS WELL AS ITS FANS

Experience Recommends "BUFFALO" Fans for Proved Performance

. . . 79 years of experience have proved the reliability of "Buffalo" Fans on the job. And our 79 years of air engineering have resulted in this superbly performing Type "BL" Limit-Load Ventilating Fan shown. Not only does it bring a new high in efficient, quiet delivery with stable performance from zero resistance to shutoff — but it's designed to fit the system. The "BL", with its curved inlet vanes, is efficient even when installed near elbows or with other unfavorable inlet conditions. Its ample inlet collar simplifies duct connections. Too, you can specify the "BL" for any standard arrangement and drive, and in a range of sizes for 1000 to 500,000 cfm deliveries. *Write for Bulletin F-101 for full details.*

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VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

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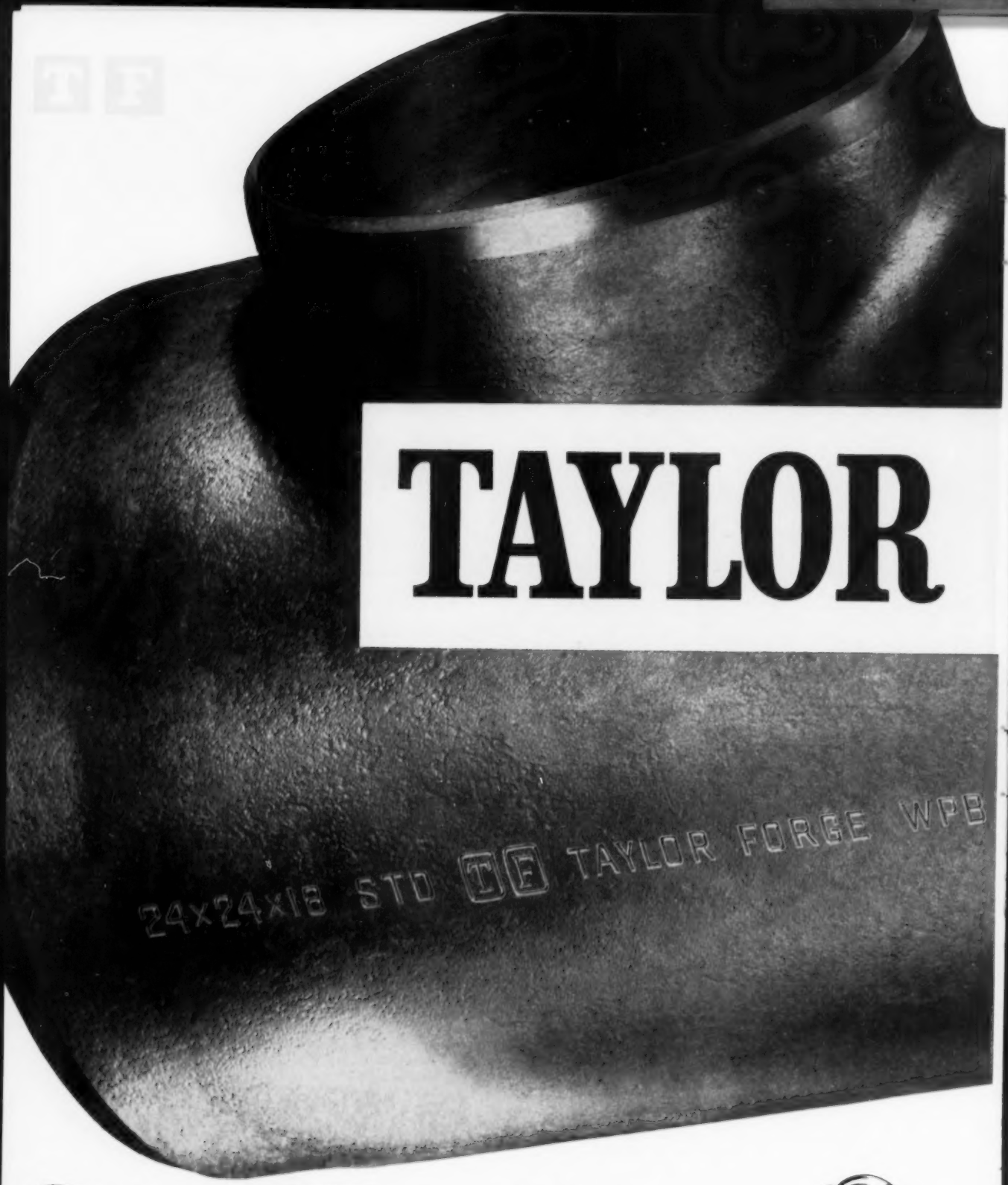


Welding nozzles

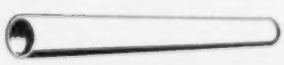
T.E.M.A. flanges and channels

Multiple outlet headers

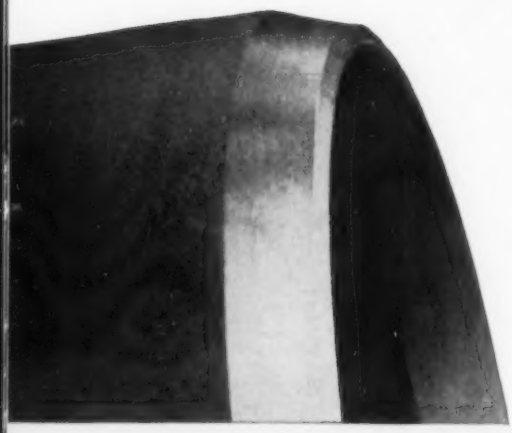
Production forgings

Venturi reducers

Spiral weld pipe


Large diameter electric weld pipe

Welding necks



Engineered for accuracy and precision...

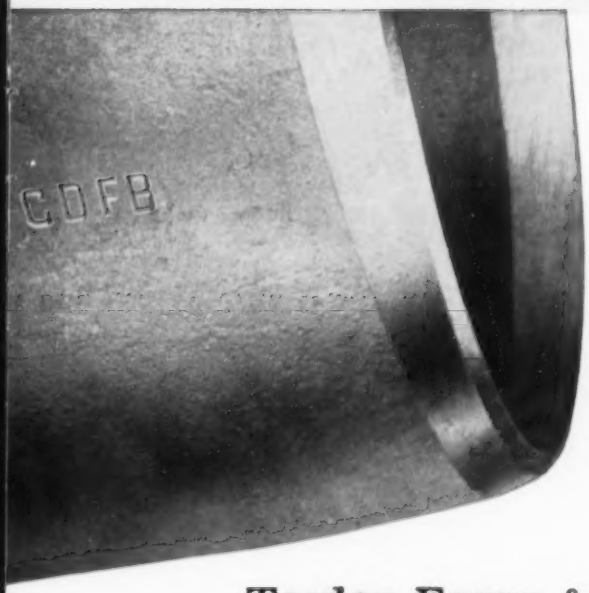
Designed for greatest strength...

Built for maximum service...

to make any good piping job BETTER

FORGE

Welding Fittings and Forged Flanges



By any method of value analysis . . . by any measurement of quality . . . by any standard of comparison . . . you can't buy finer products than those made by Taylor Forge. The line, truly complete, includes WeldELLS and all other welding fittings of any thickness, many in sizes through 42" O.D.; forged and rolled flanges of any required diameter and pressure rating; multiple outlet headers; venturi type reducers, hot tap tees; anchor flanges; in fact, just about everything you need to simplify piping construction and speed up the job.

To be sure . . . . turn to Taylor Forge . . . . ***"traditionally dependable."***

Taylor Forge & Pipe Works

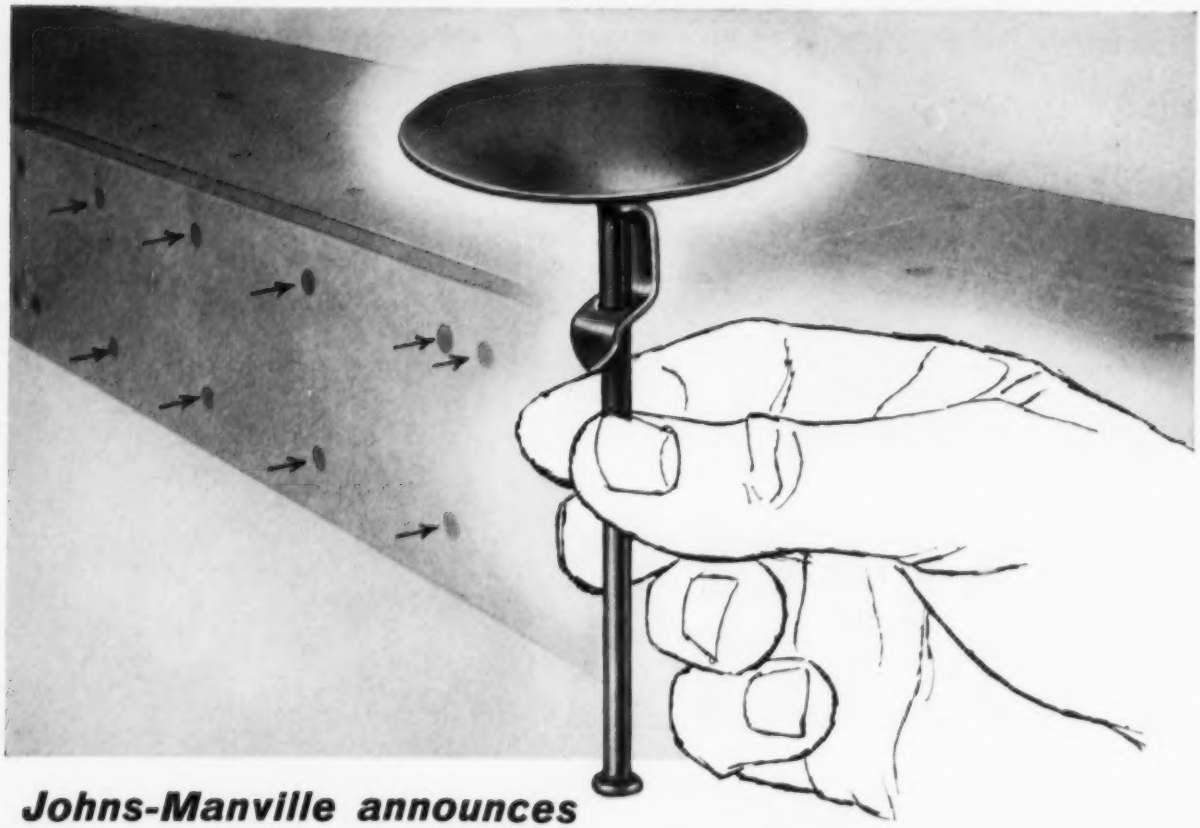
General Offices and Works: P. O. Box 485, Chicago 90, Illinois

Plants at: Carnegie, Pa., Gary, Ind., Houston, Texas, Fontana, Calif., Hamilton, Ont., Canada

District Sales Offices: New York, Philadelphia, Pittsburgh, Atlanta, Chicago, Houston, Tulsa, Los Angeles, San Francisco, Toronto, Calgary.

For the *best* of service call your Taylor Forge Distributor

He carries a full stock of Taylor Forge Welding Fittings and Forged Flanges and can supply your needs promptly. He's a good man to know for he understands piping and through him you have available the services of Taylor Forge engineers for help and advice on any piping problems.



Johns-Manville announces

HERE'S HOW IT WORKS
1. Mechanic depresses insulation exposing tip of pin.
2. Pin is engaged by locking-holes on clip.
3. Clip is pushed home flush with insulation surface.
4. Vapor barrier (where necessary) is easily applied over clip.

a *Flush Clip* for impaled insulation

Improves appearance **Won't tear vapor barrier**

Safeguards personnel

Another revolutionary development introduced by Johns-Manville

Now . . . you can insure a smooth and unbroken finish on air conditioning ducts. For this new *Flush Clip*, developed and produced by the Graham Manufacturing Corporation of Royal Oak, Mich., firmly secures impaled insulation without sacrificing eye appeal or impermeability of vapor barrier.

Plant personnel will appreciate the neat, smooth appearance unbroken by ugly protuberances. The Graham® *Flush Clip* also provides an excellent surface for decorative or identification painting. Insulation engineers will be able to furnish a snugger fitting, more efficient job with an unbroken vapor barrier that is easily applied. Installation crews will find their work simplified and speeded—with no trimming and cutting required—and a greatly reduced injury hazard from sharp, jagged projections.

Johns-Manville's Industrial Contract Department has worked closely with the Graham Manufacturing Corporation in field-testing the Graham *Flush Clip* on industrial installations. Used in conjunction with the Graham Insul-Pin System, it has been proven to operate ideally with J-M Spintex Insulation, plain and faced. For more information and samples, contact your nearest J-M Insulation Contractor. Or write Johns-Manville, Box 60, New York 16, New York. In Canada, Port Credit, Ontario.

JM PRODUCTS

Johns-Manville *first-in* INSULATION

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Sidewall and Ceiling Grille

ALL NEW SERIES 200 WITH

100% Adjustability

- Handles Cooling and Heating Air Patterns with Equal Efficiency.
- Positive Shutoff . . . No Damper Required.
- Amazing New Solid Section Louver Design Curved for Positive Air Control.

5 IMPORTANT APPLICATIONS

1. For overhead forced air systems.
2. For replacement of outmoded warm air registers when cooling is added.
3. For replacement of inefficient outlets in problem areas to correct chilling or uncomfortable drafts.
4. For bringing in overhead air conditioning where steam or hot water are now used.
5. For high sidewall installations.

GIVE YOUR CUSTOMERS QUALITY THAT CANNOT BE DUPLICATED.

MODELS TO GIVE 1, 2, 3 or 4-WAY DIRECTIONAL AIR PATTERNS

ANOTHER TITUS FIRST! Test-proven sidewall and ceiling grilles to handle the complex demands of modern heating and cooling. Assure superior efficiency in any forced air heating or cooling system. Old-fashioned, non-adjustable designs simply cannot compare.

Clip and Mail Coupon Today!

TITUS MFG. CORP., WATERLOO, IOWA

GENTLEMEN: Please rush me complete new catalog, price lists and discounts on the new 200 Series Sidewall-Ceiling Grille.

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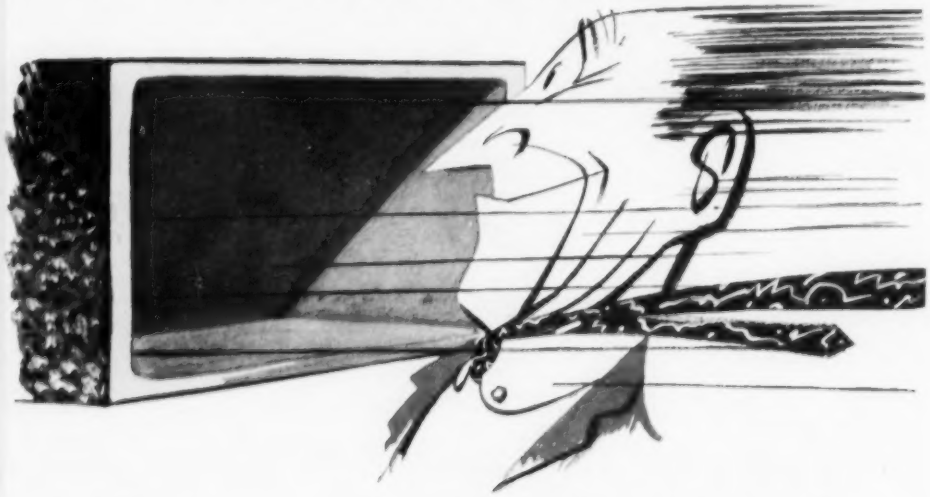
GUSTIN gb BACON

Line ducts with ULTRALITE #300



and move up to 7500 cfs of air—

***without* objectionable noise!**

***without* eroding the duct liner!**

***without* much more air resistance than you get from *bare metal ducts*!**

For performance, there is nothing on the market today like Ultralite #300 — the only spray-coated duct liner of long textile type glass fibers.

Ultralite #300 possesses the density that it takes to silence high frequency fan noise. Its long staple strength and spray-coating prevents delamination even in high velocity systems. And its .021 friction coefficient compares very favorably with .019 coefficient of unlined bare metal ducts.

Ultralite #300's performance in all air conditioning systems — low, medium or high velocity — can well mean the difference between a successful and an unsatisfactory job . . . may even mean a difference in the size of duct required to handle the flow of air! Get the facts today from your nearby Ultralite distributor whose phone number is listed in the adjacent column.

Write Today for New 8-Page Technical Brochure "Ultralite Thermal and Acoustical Duct Insulations"

GUSTIN-BACON *Manufacturing Company*

Thermal and acoustical insulations • Molded glass fiber pipe insulation
Pipe couplings and fittings

220 W. 10th St., Kansas City, Mo.

Guaranteed TO SHUT TIGHT*

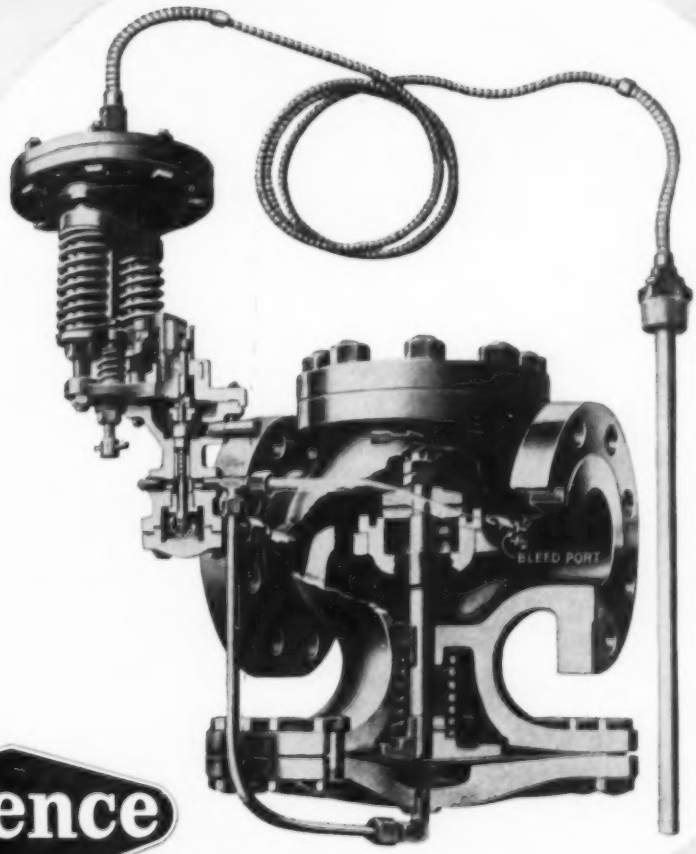
*When equipped with a SECO Metal Seat and Disc on steam service and protected by an approved Strainer, a Spence Regulator is guaranteed to shut tight when the demand for steam ceases.

Expensive steam leaks due to a lack of absolutely tight shutoff are eliminated in Spence Temperature Regulators. Here is why we can make such a guarantee:

First, our temperature regulators are of the single seat design. Seats and discs are made of durable SECO Metal. More than 20 years experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year without requiring expensive repairs or special attention.

Want more facts? Write for Bulletin T50 giving full details.



SPENCE
TYPE ET150
Temperature
Regulator

Spence

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

Air Conditioning? *Heat exchange applications?* *Design?*

What are YOU doing in Aluminum?

MANUFACTURING REFRIGERATION EQUIPMENT?

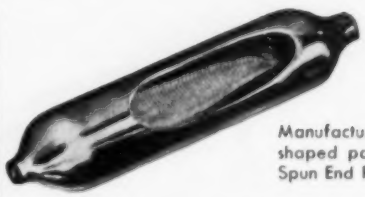
Furniture? **Building?**

GENERAL MANUFACTURING?

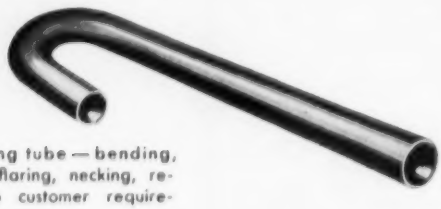
. . . Here's what WE'RE doing

Producing plain aluminum tube —drawn or extruded—in straight lengths or coils.

Making Wolverine Trufin* in a variety of alloys in drawn or extruded aluminum.



Manufacturing one-piece, tubular-shaped parts via the Wolverine Spun End Process**.



Fabricating tube — bending, beading, flaring, necking, reducing—to customer requirements.

Extruding aluminum — satin-smooth—into the shape you need and to your specifications.

. . . Let's get together!

If you are modernizing your products with aluminum . . . cutting their weight . . . improving their quality . . . let's get together.

You'll find there's quality-plus in Wolverine aluminum tube and shapes—the kind of quality that's built only through years of metalworking experience. Wolverine's Field Engineering Service team is at your beck and call to answer questions on alloy, design, fabrication. Write for your copy of the aluminum catalog. It's loaded with information you can use.

WOLVERINE TUBE, 1461 Central Ave., Detroit 9, Mich.

Wolverine Trufin is available in Canada through the Unifin Tube Company, London, Ontario.

WOLVERINE TUBE

Division of Calumet & Hecla, Inc.

MANUFACTURERS OF QUALITY-CONTROLLED TUBING AND EXTRUDED ALUMINUM SHAPES

*REG. U.S. PAT. OFF.
**A PATENTED PROCESS RE. 22465

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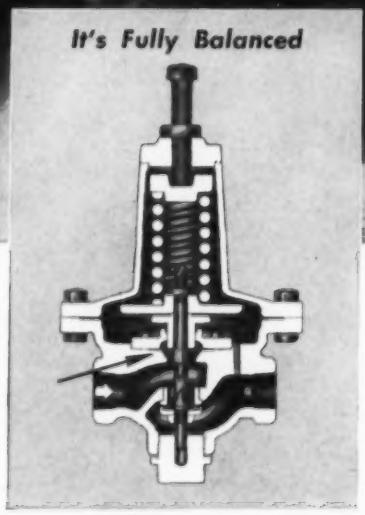
EXPORT DEPARTMENT, 11 EAST 40TH STREET, NEW YORK 16, NEW YORK

Here is the new LESLIE "HI-FLO" Water Reducing Valve with 50% more capacity

It's Fully Balanced



Unique construction of "Hi-Flo" Reducing Valve. Note the small lower diaphragm that provides fully balanced, floating action.

HERE IS THE ALL NEW Leslie Reducing Valve with *capacity-regulation* features that have never been offered before. Here is a regulator with 50 - 100% greater capacity by actual test.*

Here's the unbeatable combination of design features:

"HI-FLO" — Large bowl construction; long stroke diaphragm gives full flow of water and other non-corrosive liquids.

FULLY BALANCED — The main valve, fully balanced by lower diaphragm, virtually floats to provide smooth, friction-free, throttling action.

DROP-TIGHT SHUTOFF — Resilient seating disc provides tight closure under all conditions.

TROUBLE-FREE DESIGN — Chatter and hammer eliminated; no piston cups or seals to clog or change. Corrosion resistant trim with renewable interchangeable fit.

Ask your Leslie Engineer to show you how the exclusive Leslie "Hi-Flo" valve can be used to your advantage in water reducing stations, fuel oil pressure control, process lines, etc. He's in your classified directory under "Valves" or "Regulators".

Write today for Bulletin 553 for graphic performance comparison and complete capacity data.

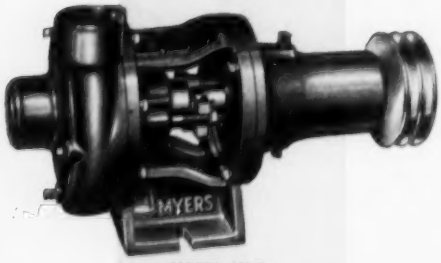
TRADE LESLIE MARK

REGULATORS AND CONTROLLERS

LESLIE CO., 237 GRANT AVENUE, LYNDHURST, NEW JERSEY

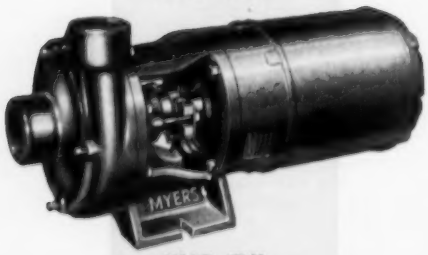
CONTROLLED QUALITY MEANS QUALITY CONTROLS

MODEL 100-B
Rotary seal only



MODEL 125-B
Shown with stuffing box
(available with rotary seal)

MODEL 100-M
Rotary seal only



MODEL 125-M
Shown with stuffing box
(available with rotary seal)

A Complete Line of Centrifugals for Air Conditioning from

MYERS

tops in pumps since 1870

FULL RANGE OF SIZES
⅓, ½, ¾, 1, 1½, 2, and 3 horsepower, motor-mounted or belt-driven models.

TWO CASING SIZES
1″ x 1¼″ or 1¼″ x 1½″.

ALL-BRONZE IMPELLER
Accurately balanced for smooth operation.

REMOVABLE BRONZE WEARING RINGS
Easily replaced for longer pump life.

ROTARY SEAL
Eliminates leakage (stuffing box may be specified on "125" models).

CORROSION-RESISTANT SHAFT
Stainless steel for trouble-free service.

WIDE RANGE OF CAPACITIES AND HEADS
Capacities to 90 GPM. Heads to 135 feet.

Write today *for Bulletin 210 on* Myers *Centri-Thrift Pumps.*

Myers **PUMPS** WATER SYSTEMS AND WATER SOFTENERS

The F. E. Myers & Bro. Co., Ashland, Ohio

1906-1956

50 years of growth and progress

THE MOST COMPLETE LINE OF CONDENSING UNITS FOR THE AIR CONDITIONING AND REFRIGERATION TRADE

PROVEN QUALITY

50th Anniversary

BRUNNER

SINCE 1906

DEPENDABLE

1956 marks the end of Brunner's first fifty years . . . and the beginning of new sales opportunities for you!

With the addition of new and redesigned models, Brunner now offers the most complete line of open-type refrigeration and air conditioning condensing units . . from 1/4 through 100 H. P. . . available from a single manufacturing source.

Outstanding is the full line of new, moderate speed compressors in the over-10 H.P. class featuring pressure lubrication, new lightweight running gear, standardized valve plate assemblies, and a new Brunner exclusive . . . an automatic switch-over system that cuts in to protect

BRUNNER

SINCE 1906

ENGINEERING FOR THE FUTURE

the compressor in case of pressure lubrication failure.

Brunner-Metic semi-hermetic condensing units are available from 1/4 through 3 H.P.

Redesigned BAC packaged air conditioners will include 3, 5, 7½ and 10 H.P. models, featuring separate discharge plenum.

Brunner dependability has long been a "buy-word" in the refrigeration and air conditioning industry. And today it's better than ever!

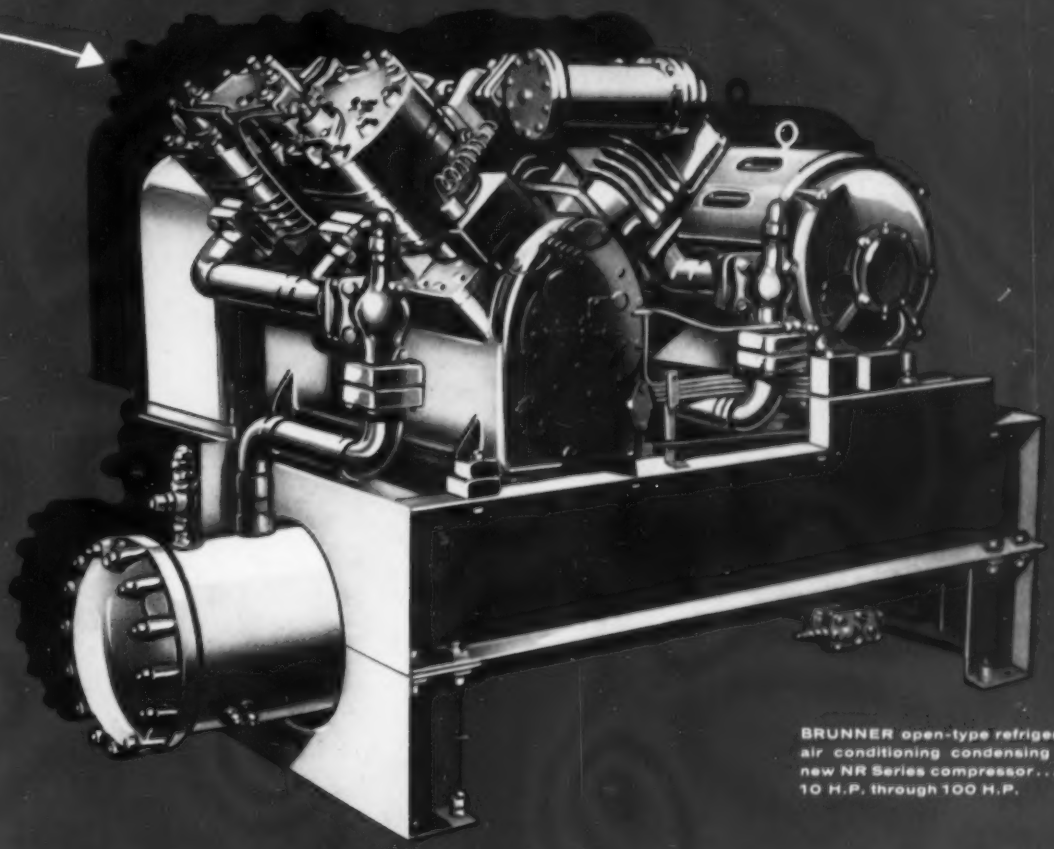
See your Brunner representative, or write for all the facts about the complete Brunner line.

BRUNNER MANUFACTURING CO., UTICA, N.Y.

The Brunner Company, Gainesville, Ga.

In Canada: Brunner Corp.(Canada) Ltd., Toronto, Ont.

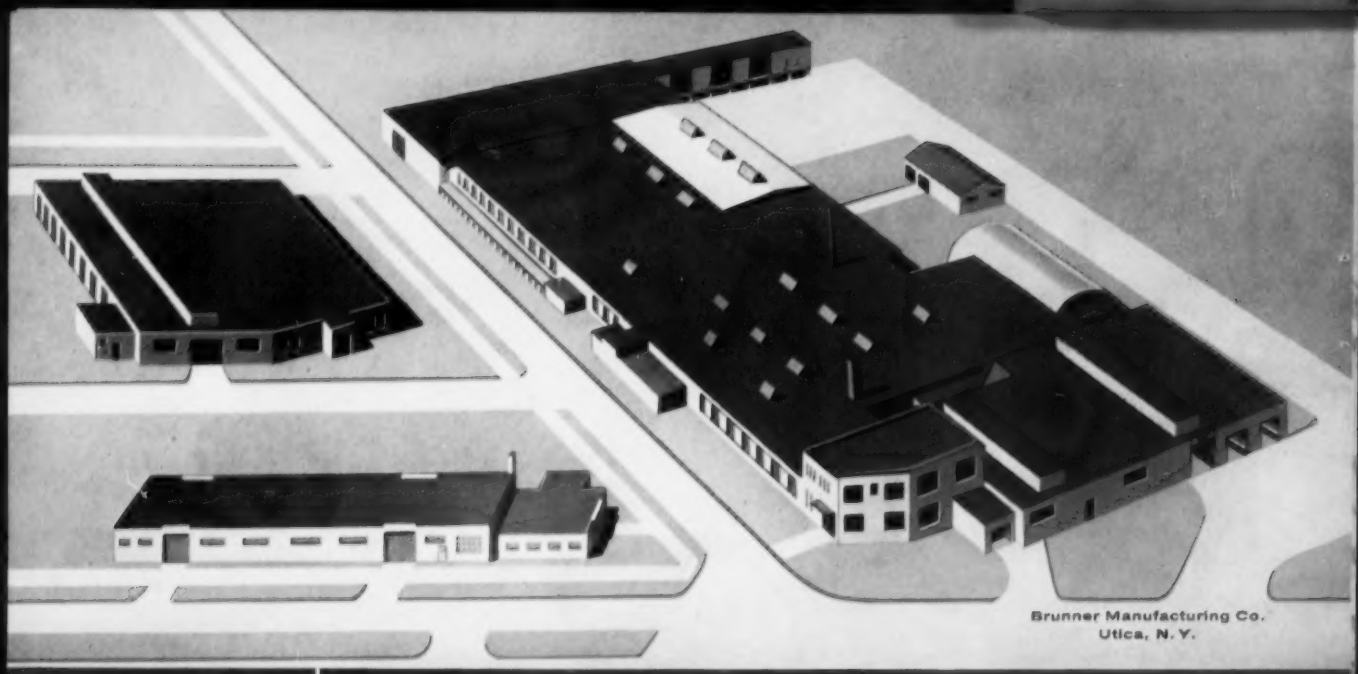
AND IF YOU NEED AIR COMPRESSORS—Brunner has a complete line, for every requirement, ranging from 1/4 H.P. through 50 H.P.



BRUNNER open-type refrigeration and air conditioning condensing unit with new NR Series compressor... available 10 H.P. through 100 H.P.

MEANS MORE SALES DOLLARS FOR YOU!

BRUNNER-METIC semi-hermetic refrigeration condensing unit... air-cooled or water-cooled... from ¼ H.P. through 3 H.P.



Brunner Manufacturing Co.
Utica, N. Y.

NEW PLANT FACILITIES

PLANNED RESEARCH

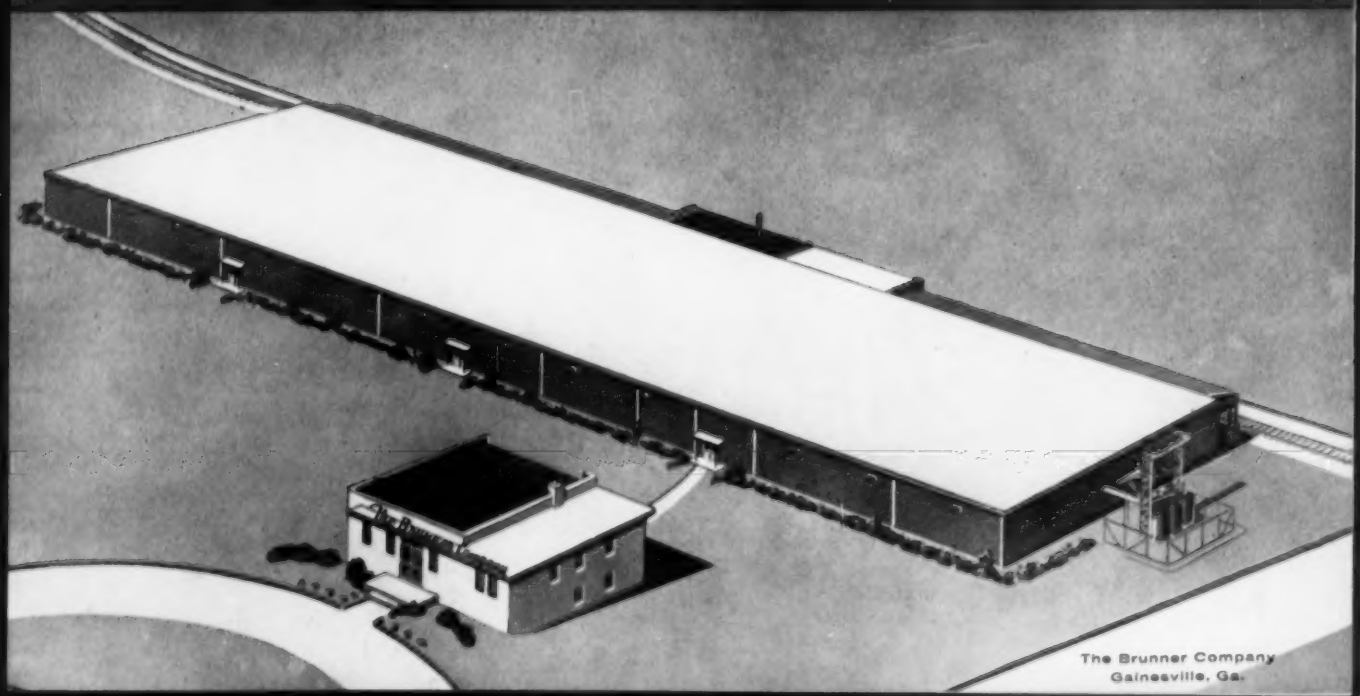
ADVANCED ENGINEERING

Increased demand for Brunner-Metics is now being met by The Brunner Company's new plant at Gainesville, Ga.

A progressive program of research and development assures continued Brunner leadership in quality and performance.

Brunner engineering brings you more sales opportunities through new applications for Brunner condensing units . . . plus a long list of improvements in the standard Brunner lines.

BRUNNER
SINCE 1906



The Brunner Company
Gainesville, Ga.

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We have a copy of the Dover Complete Line 12-page catalog waiting for you. It will answer your questions about Dover towers. Just fill in the attached coupon and your free copy will be on its way to you.

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HERE'S THE RIGHT TOWER FOR THE JOB!

DOVER Complete Line of Packaged Cooling Towers

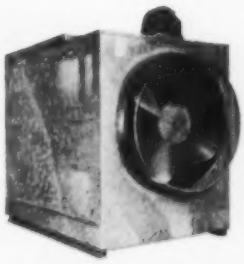
Whatever your cooling tower needs, now there is a Dover packaged cooling tower that's just right for the job. From 2 to 100 tons capacity, the complete line of Dover towers is America's new standard in packaged cooling towers.

Here is quality at a competitive price! While Dover towers are priced among the lowest in the industry, when you consider all the features you get only in a Dover tower, they are actually less expensive than others.

A TOWER FOR EVERY NEED . . . A NEED FOR EVERY TOWER!

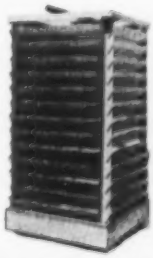
VERTICAL INDUCED DRAFT TOWER
with Centrifugal Blower—Series V

Ideal where space is limited. Install this compact tower anywhere in the building. Piping requirements are at a bare minimum. Super-quiet operation lets you place it in rooms close to workers—and it will ventilate the room that it is in. From 5 to 100 tons.



HORIZONTAL INDUCED DRAFT TOWER
with Propeller Fan—Series CF

A compact unit with all the design and construction features that you have been looking for in a packaged tower. Neat in design, rugged in construction, it is ideally suited for small air conditioning and refrigeration installations and for jacket water or air compressor cooling. From 2 to 100 tons.



NATURAL DRAFT TOWERS
In Steel & Redwood—Series S—or All Steel Construction—Series K

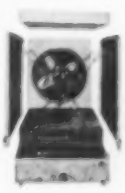
Take your pick from either the new all-steel construction or the somewhat lower-priced redwood and steel construction. Both have the exclusive Dover bolt-free principle for quick, easy installation. Two men can erect some sizes in just 20 minutes. From 3 to 100 tons.

LOOK AT THESE BONUS FEATURES YOU GET ONLY IN DOVER TOWERS!

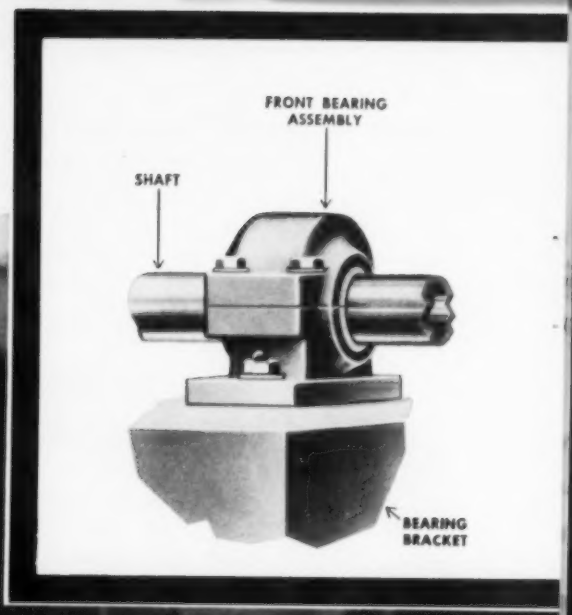
HOT-DIP GALVANIZING . . . all metal parts on all Dover towers are hot-dip galvanized *after* fabrication. This costs you nothing extra, yet saves you a lot by stopping costly rust and corrosion problems.

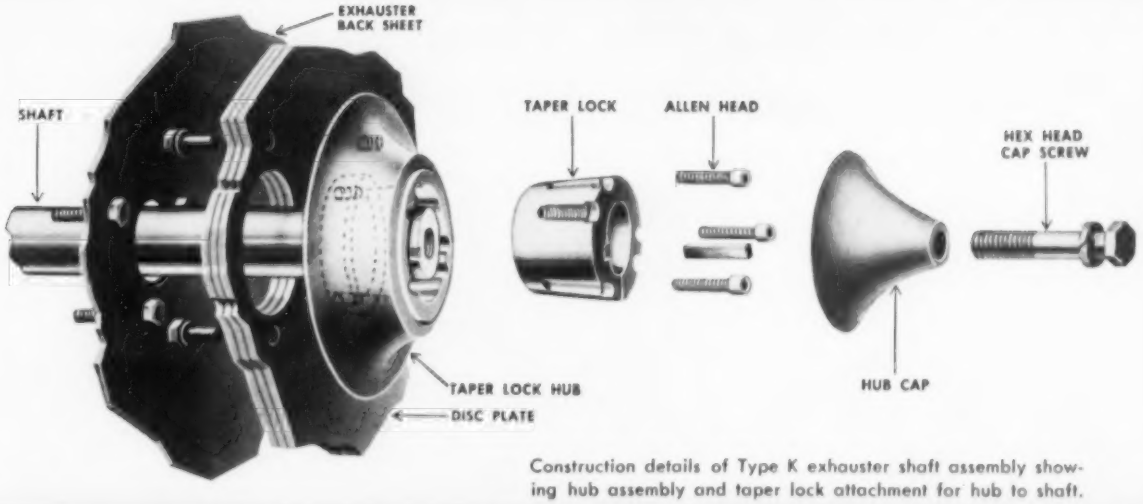
STAINLESS STEEL FANS . . . and shafts are standard equipment on all Dover Series CF towers, providing you with years of trouble-free performance. Built to last.

"TAKE-APART" FEATURE is another Dover exclusive! By virtually eliminating bolts, Dover towers can be quickly taken apart and reassembled where basement or rooftop locations make this desirable.



AAF EXCLUSIVE!





Construction details of Type K exhauster shaft assembly showing hub assembly and taper lock attachment for hub to shaft.

Special Hub Assembly on Industrial Exhauster ...cuts maintenance and replacement costs

Highly efficient unit an outstanding success in thousands of exhaust system installations

Talk about money-saving features – the new AAF Type K Industrial Exhauster has them! For one thing, the exclusive Taper Lock Hub Assembly permits fast, easy changeover on heavy-duty applications where periodic wheel replacement is anticipated. Cuts maintenance time in changing wheels. Eliminates the problem of impellers freezing to shafts. A NEW shaft is seldom required!

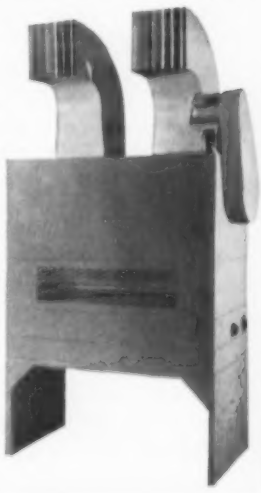
If you have an exhaust system problem of any kind, you can depend upon the AAF Type K Exhauster to provide high efficiency. Here is an exhauster that has already proved itself a heavy-duty workhorse in AAF Dust Control Systems faced with the severe requirements of high static pressures, heavy dust concentrations and frequently, highly corrosive conditions. In major industrial plants throughout the country, it has met with outstanding success!

OTHER DESIGN ADVANTAGES

NEW IMPELLER DESIGN	Another AAF Exclusive! Narrow wheel design assures smooth operation when handling heavy dust loads – even with material accumulation on the wheel!
HIGH EFFICIENCY	Maintained over a wide range of operations and variations in static pressures.
HEAVY DUTY SHAFT AND BEARINGS	Insure longer unit life. Narrow wheel design also increases effectiveness of shaft and bearings by reducing length of wheel overhang.
COMPLETELY ROTATABLE	In 45° increments of discharge positions in the field.
COMPLETELY REVERSIBLE	In the field, to allow either clockwise or counter-clockwise rotation.

Avoid air "Starvation" in your Plant with HERMAN NELSON Industrial Heaters for make-up air.

Replace exhausted air, balance minus pressures with Herman Nelson Industrial Heater make-up air units. They eliminate air "starvation" in various areas – such as sudden blasts when doors are opened . . . drafts and uneven temperatures that cause discomfort. Their big capacity does the job of many smaller, propeller-type units. Available in heat capacities ranging to one million BTU's.



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GENERAL OFFICES: LOUISVILLE, KY. • PLANTS IN LOUISVILLE, MOLINE (ILL.), MORRISON (ILL.), CHICAGO AND MONTREAL (CANADA)

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Leading architects, engineers and contractors know this about air conditioning...

You always protect your reputation when you specify the brand that has an outstanding reputation

Airtemp

COMMERCIAL AND INDUSTRIAL AIR CONDITIONING

Reputation—man's *priceless* possession!

One of the best ways to maintain your own reputation is to be sure you specify products with good names and performance records. Such a name is AIRTEMP—product of famous Chrysler engineering—for 21 years a leader and pioneer in air conditioning.

AIRTEMP'S advanced engineering and precision manufacturing are your *guarantee* of outstanding performance. When you deal with AIRTEMP, you get the advisory service of the best engineers of Airtemp Construction Corporation. And you get the follow-through benefit of a nation-wide network of trained service personnel and facilities.

Our representatives will be pleased to advise you on which is the best system for your every purpose. And whenever you specify AIRTEMP, you can rest assured your clients will be happy. They will find that operating costs are unusually low—thanks to efficient, modern AIRTEMP design.

Write for full information. For complete details on what AIRTEMP offers you, write to: Airtemp Construction Corporation, Dayton 1, Ohio.

Airtemp Builds Air Conditioning To Fit Every Requirement

From installations like these comes convincing proof of Airtemp dependability!

COMMERCE COURTS (Office Building) Commerce Court and Raymond Blvd., Newark, N. J. Architect and Engineer: Henry Boyer

TITLE GUARANTY BUILDING, St. Louis, Mo. Architect: Raymond E. Maritz; Consulting Engineers: Leo S. Weil and W. B. Moses; Mech. Engineers: Brussel & Viterbo; Air Conditioning Contractors: General Installation.

THE *FORWARD* LOOK IN AIR CONDITIONING

AIR CONDITIONING • HEATING FOR HOMES, BUSINESS, INDUSTRY

Airtemp
CONSTRUCTION CORPORATION
SUBSIDIARY OF CHRYSLER CORP.

Beardsley Terrace Housing, Bridgeport, Conn. • Engineers: Frederick M. Hill and Paul D. Harrigan, New Haven.
Architects: Lindsay & Johnson, Bridgeport. • Heating Contractor: Bridgeport Pipe & Engineering Co., Bridgeport. • General Contractor: E & F Construction Co., Bridgeport.

Here's why Mechanical Engineer is **enthusiastic about Sarcotherm in 1200-family 16-building project**

AS Mechanical Engineer Paul D. Harrigan writes, "Sarcotherm steam heating controls in Beardsley Terrace Housing...working perfectly through extreme part of Winter as well as in Spring...sensitive, accurate and flexible...the Housing Authority, the architects and we ourselves are entirely satisfied."

Sixteen Sarcotherm Weather-Compensated Controls serve Beardsley Terrace. Of the continuous, modulated flow design, they provide individual zone control for the steam heating of each building. Precisely engineered orifice plates assure the proper steam flow to each heating unit.

COMPLETE SYSTEM — UNDIVIDED RESPONSIBILITY

Sarcotherm engineers cooperate in the preparation of working drawings and wiring diagrams for each job, and follow through with on-the-job help and supervision of installation.

Sarcotherm assumes undivided responsibility because the Sarcotherm System is COMPLETE — includes zone controls, panels, thermostats and steam specialties — traps, valves, and air eliminators.

Write for further details. Sarcotherm Controls, Inc., Empire State Building, New York 1, N. Y.

FEATURES OF SARCOTHERM CONTROL SYSTEMS

1. **Easy to install** — working drawings and wiring diagrams furnished for each job.
2. **Easy to maintain** — because of simplified construction, fewer parts.
3. **Easy to adjust** — to any desired setting.
4. **Engineered orificing** — assures even heat flow to all units from the start.
5. **Undivided responsibility** — by one maker, Sarcotherm, for the complete control system.

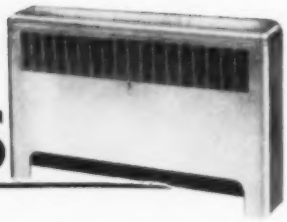
4003-B

Sarcotherm

An affiliate of SARCO COMPANY, INC.

WEATHER-COMPENSATED CONTROLS FOR **STEAM, HOT WATER AND RADIANT** *HEATING*

6600 Airtherm CONVECTORS



Add Beauty and Comfort to the . . .

. . . 1736-Unit PRUITT Housing Project

The clean, uncluttered design of Airtherm Convectors blends perfectly with the modern decor of the new Wendell Oliver Pruitt Homes in St. Louis. Their outstanding performance, ease of installation and easy maintenance make them exceptionally practical for this huge housing project.

Airtherm Convectors, available in wall, recessed or free-standing models, can help you solve a wide range of heating problems. Write for Catalog 702-A or consult our Catalog in Sweets Architectural File 28c Ai.

Architect—Hellmuth, Yamasaki & Leinweber, Inc.
Mechanical Engineer—John D. Falvey
General Contractor—Millstone Construction, Inc.
Heating Contractor—Kremer-Hicks Company

Convectors

Vertical Steam Unit Heaters

Horizontal Steam Unit Heaters

Centrifugal Fan Type Unit Heaters

Direct Fired Space Heaters

Gas Fired Unit Heaters

FOR HEATING SATISFACTION . . . THINK FIRST OF

Airtherm MANUFACTURING COMPANY

711 South Spring Avenue • St. Louis 10, Missouri

ACCURATE IN SIZE AND TOPS IN QUALITY!

Chase® Type L Copper Tube!

It's a sure thing! Your heating, air conditioning and refrigeration equipment will deliver dependable, *peak performance over the years,* when you fabricate with Chase Type L copper tube!

Inside and outside diameters accurate to thousandths of an inch assure proper tolerances for fitting connections. That means extra-easy assembly of finned sections. Smooth interiors of tube and Chase solder-joint fittings insure a steady, even flow of heating or cooling liquids. And for extra cleanliness, you can get Chase Type L copper tube tightly capped at slight extra cost.

Order Chase Type L copper tube, Chase extra-soft copper refrigeration tube and Chase wrought copper solder-joint fittings from the Chase wholesaler near you!

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Electronic control of commercial air conditioning is only seven years old, yet already it has set new standards in operating economy and convenience. Why? The answer lies in the basic advantages of the electronic system. They're presented here as another in a series of reports from the pioneer manufacturer of electronic controls.

The Electronic Revolution in commercial

Honeywell electronic Supervisory Data-Center permits complete management of air conditioning systems from a single point. This is centralized control — now practical and economical for installations of any size.

Honeywell Electronics
Report Number Two

As MODERN standards of indoor comfort become more refined, they demand year-round air conditioning plants of increasing complexity.

This is costly equipment. It must pay off in terms of efficient, economical operation. Hence the mounting interest in controls — most vital accessory the air conditioning system can have.

When Honeywell developed the electronic thermostat in 1949, it was possible at last to have a control installation that met every demand of architects, engineers and building managers.

For with electronics, *central control* comes into its own as a tool for getting the most out of the air conditioning system. The Supervisory Data-Center, an electronic panel, gives one man supervision over the entire system from one control point. The result is an entirely new kind of convenience and efficiency that means savings—*big* savings—in several important ways.

Take the case of the modern skyscraper, such as the huge new Mid-America Home office of the Prudential Insurance Company in Chicago. With a conventional control installation, this building's 203 thermostats could require the services of full-time maintenance men for operational checks alone.

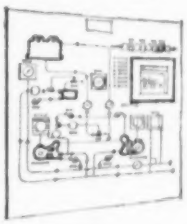
Not so with the Prudential's electronic installation. From a central location, one man can make a one-degree adjustment in the comfort level of a space 20 floors away, if needed. His control is based on complete information supplied by the Supervisory Data-Center, where it's displayed visually for analysis and interpretation.

Another example is in the new quarters of *The Houston* (Texas) *Post*. Here, a Honeywell electronic panel automatically oversees the entire 400-ton cooling plant's operation. Visual display of performance data permits convenient, instantaneous review of component function, indicating any adjustment needed.

Instrumentation's Role

Honeywell instrumentation, built into the central panel, is the ultimate refinement that stamps the electronic control installation with the mark of superiority.

For by combining Honeywell-made instruments with Honeywell electronics, engineers are able to achieve certain advantages that assure control efficiency never before realized.



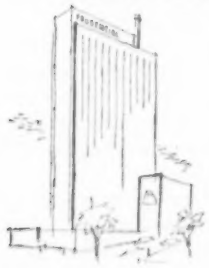
Typical Honeywell Electronic Panel

air conditioning

Precision indicators *at the panel*—the eyes of the central panel—show temperatures throughout the system. Through electronics, control points can then be adjusted remotely with unusual accuracy. Only electronics makes economically feasible such a convenient combination of data visualization *and* control point adjustment at a spot remote from the controlled equipment. It's this combination that affords the precise control needed to avoid costly overheating or overcooling.

Instruments also permanently record performance of heating and cooling components, providing precise data for efficiency studies.

Other Important Benefits



Mid-America Home Office, The Prudential Insurance Company, Chicago

Valuable as it is, central control is only one of the advantages that's proving the benefits of the electronic installation. Another is automatic sequencing, which only electronics makes fully practical for any commercial system.

With electronics, automatic sequencing is *convenient:* the *same* thermostat may sequence from heating to full ventilating to mechanical cooling. It's *effective:* it utilizes the thermostat's full operating range. It's *economical:* automatic use of outside air to carry part of the cooling load cuts refrigeration costs.

With electronics, use of *averaging* thermostats—although no substitute for adequate zoning—is no longer costly and complicated. In controlling an open area as a single zone, for example, it's simple to locate inexpensive electronic thermostats so that load changes peculiar to the enclosure's equipment or occupancy are sensed and averaged out, maintaining a constant comfort level.

Compensation Greatly Improved

Faster, more accurate, more stable compensation is achieved through electronics. Especially valuable for short-occupancy spaces such as retail stores, this feature also prevents discomfort due to variations of wind and sun effects or sudden changes in outdoor temperature. Automatic winter-summer reset, utilizing an outdoor thermostat, cures temperature drift in winter, air-cooling shock in summer. This means *consistent* comfort in any building, in any weather.

The Houston Post, Houston, Texas

No specialist is needed for installing and servicing electronic controls. Wiring is low voltage, with standard color coding easily understood by any heating and air conditioning technician. Today's installations will be up-to-date for many years to come. Maintenance and equipment aging problems are minimized, because the electronic thermostat contains no moving parts.

Key Word: Flexibility

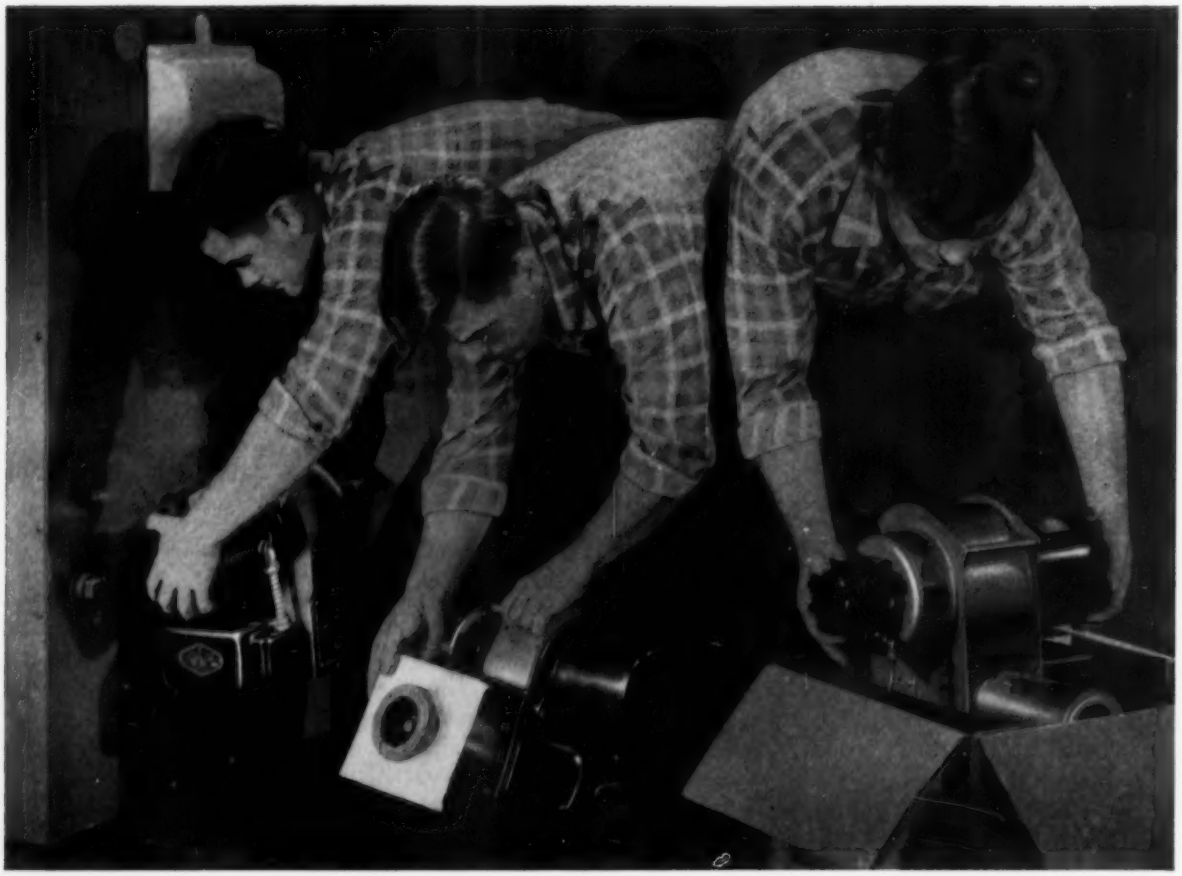
These advantages are summed up in one word: *flexibility*. It means that all or any combination of the electronic installation's features are readily adaptable to the solution of any control problem. The results are better, more efficient, more convenient operation of the air conditioning system—and important dollar savings.

In fact, it's *flexibility*—in the entire field of temperature control—that helps establish clearly Honeywell's leadership. For only Honeywell makes *all three types* of control systems: pneumatic, electric, electronic, each with distinctive advantages for certain applications. Thus only Honeywell is able, with complete objectivity, to help you select the one system shaped perfectly to the needs of the building and its occupants.

• • •

Ask for our new electronic control booklet which tells more fully how to apply electronics to your control problems. Write Honeywell, Dept. 1002, Minneapolis 8, Minn.

Minneapolis-Honeywell Regulator Company



Here's a close-up of the sling-mount. As you can see, you just slip the burner over the mount!

The trim new Oakmont is completely enclosed in a 20-gauge steel jacket. It's heavily insulated to prevent wasteful heat loss.

You can mount the burner *in only 20 seconds* on the new Oakmont Boiler

Cuts installation costs—eliminates call-backs

LOOK! In just three easy steps you can mount the Arcoflame Burner on the American-Standard Oakmont Oil Heating Unit. Why? Because of the unique sling mount. You just remove the Arcoflame from the box, slip the pressure plate over the air tube and hook the burner on the sling mount. It's as simple as that!

Additional design changes also have been incorporated in the Oakmont. It's more compact, yet retains the same high heat output. Big access doors and panels speed up cleaning, make maintenance easier.

The Oakmont comes in a wide range of sizes, with outputs ranging from 143,000 to 288,000 Btu per hour. It is tested to assure dependable, low-cost operation and eliminate profit-killing call-backs.

For further information, write to AMERICAN-Standard PLUMBING AND HEATING DIVISION, American Radiator & Standard Sanitary Corp., P. O. Box 1226, Pittsburgh 30, Pennsylvania.

AMERICAN-Standard
HOT WATER HEAT

Prudential's regional office building at Jacksonville is one of the largest structures in the Southeast. *Mechanical Contractors:* Henley & Beckwith, Inc. *Jobber:* Hajoca Corporation.

New Prudential Building in Florida Has Beth-Co-Weld Piping

This handsome structure, completed recently at Jacksonville, Fla., is one of the new regional office buildings of The Prudential Insurance Company of America. Standing on the banks of the St. Johns River, the 22-story building is one of the largest in the Southeast. Beneath its facade of marble, limestone and pink granite lies a complex network of general-purpose piping, nearly all of which is made up of Beth-Co-Weld steel pipe.

Beth-Co-Weld is good, sound pipe. It is manufactured by the continuous-weld process. It is uniform in quality, and easy to work.

Beth-Co-Weld is produced in sizes ranging from ½ in. to 4 in. in standard weight, and from ½ in. to 3 in. in extra-strong weight. It is furnished in uniform 21-ft lengths, plus or minus 1 in., as well as in random lengths.

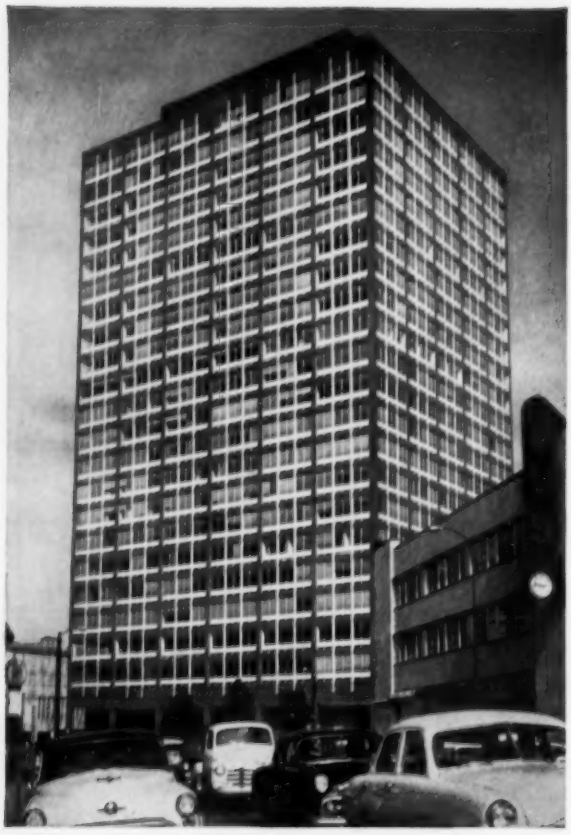
You will like the dependability of Beth-Co-Weld. Why not order a supply today from your jobber!

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



MILE HIGH: 23-story Tower Building of new Mile High Center, Denver.

SEA LEVEL: new 34th Street Office Building, New York City—26 stories high.

American Blower products assure ideal comfort conditions a mile high and at sea level

Although one of these new Webb & Knapp office buildings is in Denver (called the "mile-high city" because of its 5,280-ft. elevation)—and the other is in New York City at sea level—both provide year-round comfort with the same type of *dual* air-conditioning system.

Divided into two zones of operation (peripheral and interior), and including American Blower heating, cooling, and ventilating equipment—these dual systems offer flexible control for satisfying the various comfort needs of tenants. Precise air conditions are not only supplied to each floor, but also to different points across each floor!

New Tower Building. Architects: I. M. Pei & Assoc.; Kahn & Jacobs and G. Meredith Musick. General Contractors: Geo. A. Fuller Company. Mechanical Contractors: Kerby Saunders, Inc. Consulting Engineers: Jaros, Baum & Bowles; Severud-Elstad-Krueger.

New 34th Street Office Building. Architects: Rene Brugnoni and Rudolf C. P. Bochler. General Contractor: Webb & Knapp Construction Corp. Mechanical Contractors: Kerby Saunders, Inc. Consulting Engineers: W. R. Cosentini & Assoc.

What are your air-conditioning requirements?

Whether your plans call for a central or zone system, or for all-in-one-package air conditioning (left)—American Blower can meet your every equipment need. Call our branch office near you for information.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American-Standard

AMERICAN 75 BLOWER

Air-conditioning equipment for every business

MECHANICAL CONSULTANT: KARSUNSKY, WELLER & GOOCH CO.

Holy Redeemer School Installs and Insulates 115-Foot Steam Line with Gilsulate® in 24 Man-Hours

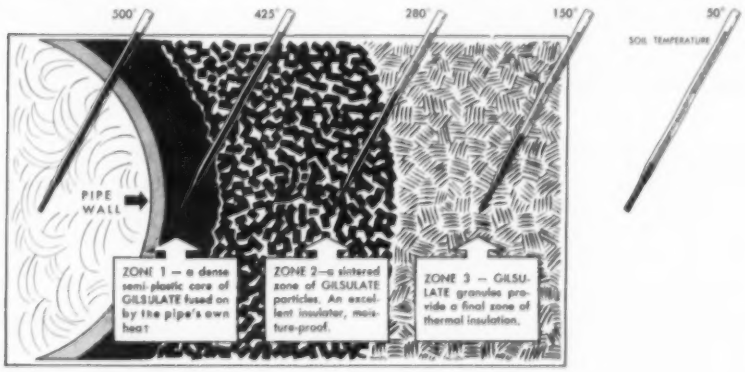
LOW-COST INSTALLATION HAS LIFETIME PROTECTION AGAINST HEAT LOSS AND CORROSION

Here's more proof that GILSULATE can save money for *you*—even on *small* as well as large jobs.

The Holy Redeemer School, Washington, D. C., recently installed 115 feet of 5-inch and 1¼-inch pipe for steam lines and return into their new 16-classroom building. Only 3 men were employed on the job. The installation was made in a trench 6 feet deep. The GILSULATE, after being wheeled to the top of the ditch, was skidded down and poured into forms around the pipes.

Total time for the *complete* job—including form construction, pouring 6½ tons of GILSULATE, and backfilling—was 24 man-hours. No other method for insulating and protecting hot underground pipes can match this performance—*Triple-Zone* GILSULATE *shows the lowest installed cost providing efficiency and permanence.*

Investigate the value of this easily installed, low-cost GILSULATE. Use the coupon below for complete information, or see your local GILSULATE distributor.


500°
425°
280°
150°
50°
SOIL TEMPERATURE
PIPE WALL
ZONE 1 — a dense semi-plastic core of GILSULATE fused on by the pipe's own heat
ZONE 2—a sintered zone of GILSULATE particles. An excellent insulator, moisture-proof.
ZONE 3 — GILSULATE granules provide a final zone of thermal insulation.

Facts about Gilsulate

1. *Easy to use*—just pour, tamp and backfill...pipe heat does the rest.
2. *Forms 3 zones* of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. *Needs no housing or mechanical sheaths;* no mixing, special handling or equipment.
4. *Only needs normal pipe spacing;* for multiple pipe or cramped conditions.
5. *Three types available;*
   Type A for 220°-310° F. temp. range
   Type B for 300°-385° F. temp. range
   Type C for 385°-520° F. temp. range

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

American Gilsonite Co.
134-B West Broadway, Salt Lake City 1, Utah — or — 1145 East Jersey St., Elizabeth, N. J.

Send me more information on GILSULATE Insulation

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at the lowest prices in history

NO SHOP CAN AFFORD TO BE WITHOUT ONE OF THESE 3 RUGGED NEW SKIL SAWS

New 6½" Model 864 only $64.50

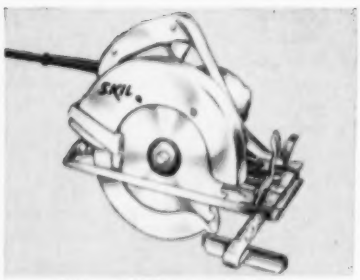
New heavy duty SKIL Saws offer a light weight compact answer to every cutting problem in the shop or on the job.

You'll find one of these SKIL Saws ideal to help you on every one of your heating, air conditioning or sheet metal jobs. This is a real heavy-duty construction tool, yet it's priced so low that it'll pay for itself in no time. Light weight, compact, powerful . . . use it to cut floor openings, duct entries, all materials including sheet metal, plaster, composition and even concrete.

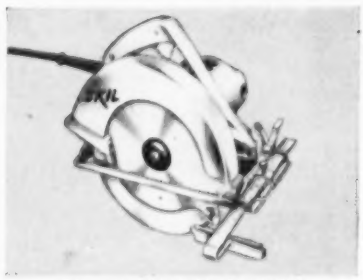
3 sizes—6½", 7¼", 8¼"—give you the right capacity for every job. New low prices give you big savings. And, all the famous SKIL features assure more profitable operation for you.

Exclusive SKIL features for better performance

- **Extreme light weight and the famous SKIL balanced design for easy handling.**
- **Easy, fast cutting in any position.**
- **High speed blade.**
- **Rugged, heavy-duty motor.**
- **Strong die-cast aluminum motor housing.**
- **Ball and needle roller bearings throughout.**
- **Quick-acting depth & bevel adjustment.**
- **Calibrated rip fence for both right and left hand cuts.**
- **Safety guard retracting handle for pocket cuts.**



New 7¼" Model 874 only $74.50



New 8¼" Model 884 only $84.50

BRIEF SPECIFICATIONS			
Model No.	864	874	884
Blade Diameter	6½"	7¼"	8¼"
Maximum Depth of Cut	2⅜"	2⅜"	2⅞"
Depth Cut at 45°	1¾"	1⅞"	2¼"
No-Load Speed	6100 r.p.m.	6000 r.p.m.	5700 r.p.m.
Net Weight	11 lbs.	13½ lbs.	14¾ lbs.

SKIL PORTABLE TOOLS

Made only by SKIL Corporation
formerly SKILSAW Inc.
5033 Elston Avenue, Chicago 30, Illinois
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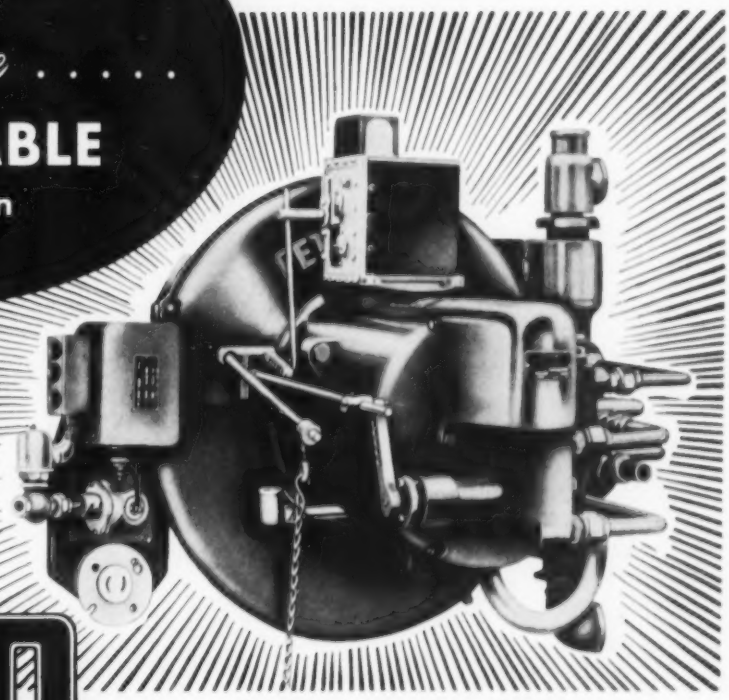
Factory Branches in All Leading Cities

Call your SKIL distributor for a Free on-the-job demonstration and a Free Trial

SIMPLE
in design
..... *therefore* .....
DEPENDABLE
in operation



PETRO
T M REG U S PAT. OFF

CAPACITIES FROM 8 TO 200 GALLONS PER HOUR

ROTARY OIL BURNER

for economical heavy oils

Why PETRO is known for DEPENDABILITY

Petro engineers are not gadget minded. They like oil burners that are sturdy and steady because that is what users like, with no hairline adjustments required for good operating efficiency.

Take oil handling, for instance. Viscosity of heavy oil isn't nearly the bugaboo it's supposed to be. Everyone knows that heavy oils can be as sticky as January molasses, or as thin as hot syrup. But that is only half the story. The other half is that at operating temperature viscosity is a negligible factor. From 160° on up it changes hardly at all. (See chart.)

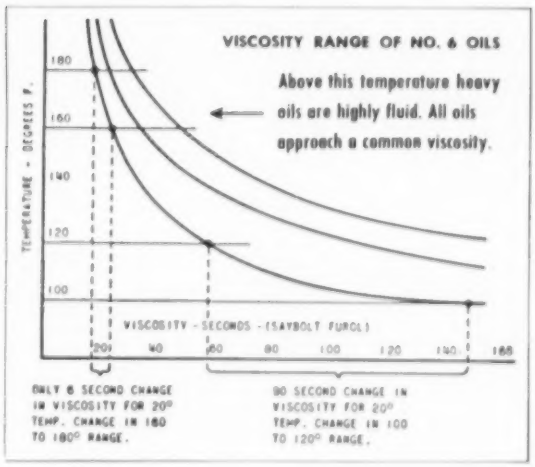
So the solution is simple. It's easy to keep the oil above the critical temperature, and not expensive either. The Petro burner has a simple valve that will not pass the oil to the nozzle before it reaches a predetermined temperature. If the oil is below operating temperature it is recirculated through the heater. On a cold start this requires about seven minutes. On restarts there is practically no time lag.

Proper heating of the oil has these advantages

1. Oil can be *accurately* metered; **2.** Oil is subject to finer atomization. (It separates into much smaller particles for better aeration and cleaner burning); **3.** Warm oil ignites quickly and easily; **4.** Petro *never* has a slug of cold oil in the feed line to the burner, which is the main cause of smoky starts.

From all of this you would expect low fuel and maintenance costs—and on this point thousands of Petro owners will bear us out.

PETRO will see you through — you can bank on it



PETRO 3226 West 106th Street, Cleveland 11, Ohio.
(In Canada: 2231 Bloor St. W., Toronto, Ont.)

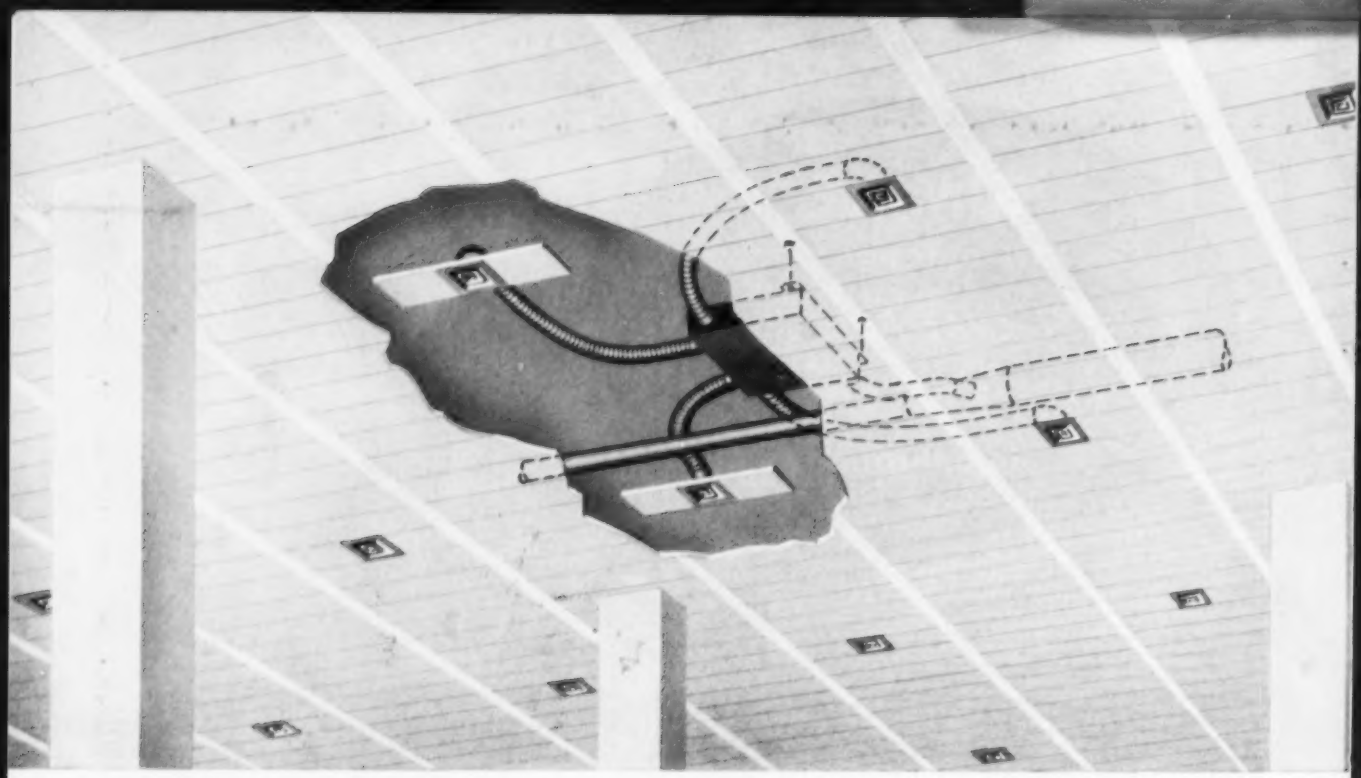
Please send me literature and specification sheets on money-saving Petro commercial and industrial burners.

Name_____

Company_____

Address_____

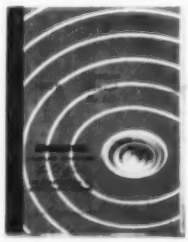
City_____ State_____



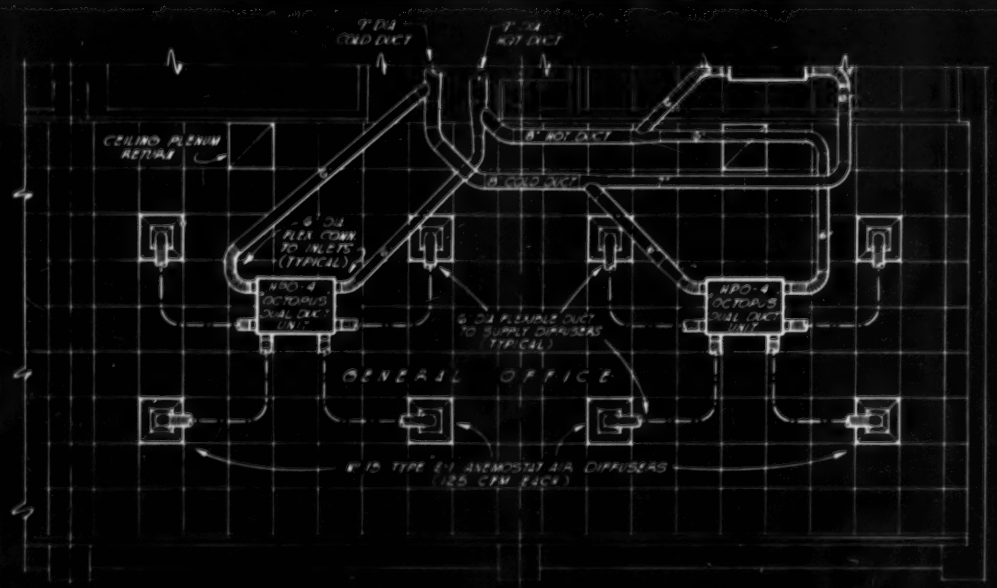
Here's *flexible* high velocity air diffusion

Here's how the new Anemostat Octopus unit works in interior zone air conditioning. High velocity air travels to a sound attenuator volume control unit, which has from *two* to *four* openings. The air is carried from these outlets through flexible hose to Anemostat diffusers. These have the same outer dimensions as the acoustical panels. If the space must be adjusted to meet changing conditions, such as subdivision of the occupied area, ceiling panels and diffusers can be quickly relocated by merely moving the flexible hose.

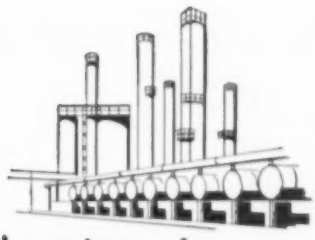
Air can be supplied to the Anemostat Octopus sound attenuators from a dual-duct system with a thermostat controlling one bay, or from a single-duct system with automatic or manual control.



Write on your business letterhead for Selection Manual 50 which gives full application and specification data on wide range line of Anemostat All-Air High Velocity units. Anemostat Corporation of America, 10 East 39th Street, New York 16, N. Y.



Diagrammatic illustration of office building showing Anemostat HPO-4 Dual-duct Units.



a tight fit is an advantage here

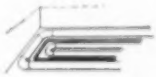
here's how B&W SEAMLESS ALLOY WELDING FITTINGS SAVE SPACE IN A PIPING INSTALLATION

Design for Compactness with B&W Seamless Welding Fittings

Consider these important advantages in making extra plant space available. Note how the elimination of flanges and bolts can simplify the entire structure.

True circularity and uniform wall thickness throughout enables special odd angle cuts to be made when necessary, and still be aligned with the pipe.

Compact piping systems are easily managed through the use of welding fittings. They permit close-nesting in corners, or against walls and ceilings.



The right selection of many possible shapes offers limitless possibilities of piping design to fit almost any space available.

Welding fittings permit simplified design of a piping system. They present a compact, streamlined layout . . . the absence of bolts and flanges allow piping lines to be close-nested, or to hug walls, ceilings or plant equipment.

The joint between fitting and pipe, in welded construction, is virtually flush, with the weld metal forming a solid, tough structure whose strength approaches that of the pipe itself.

B&W SEAMLESS WELDING FITTINGS

GRADES: Carbon, Alloy and Stainless Steels.

TYPES: Elbows, Tees, Caps, Saddles, Laterals, Nipples, Returns, Flanges, Stub Ends, Reducers, Crosses, Bull Plugs.

SIZES: Complete range of sizes and schedules.

IT PAYS TO LOOK AT THE ADVANTAGES OF USING B&W SEAMLESS WELDING FITTINGS

Welded Construction Assures Minimum Pressure Loss—True circularity and radii, uniform wall thickness, and smooth inner walls reduce friction, turbulence and subsequent erosion, adding to piping system life.

Whole Sections Can Be Shop-Fabricated—For fast installation, or where working space is limited, entire sections can be shop-fabricated and installed by any qualified welder in a few minutes.

Welded Construction is Easily Insulated — Insulation is simplified by the absence of complex flanged assemblies. Because joints are leakproof, insulation is permanent and maintenance free.

Welded Construction is Permanent — Maintenance costs are kept at a minimum because piping is permanent and leakproof. The strength of the weld approaches that of the pipe itself.

Welded Construction is Simple to Install—Dimensional accuracy of angles, radii, and bevels, assure quick and easy joining. Any qualified welder can do the job efficiently and economically.

Welded Construction is Lightweight—Strength with lightweight permits easy handling in installation. Unwieldy sections can be joined on the ground, and then quickly fastened into position.

THE *NATURAL* SOURCE FOR ALLOY FITTINGS

B&W TUBULAR PRODUCTS DIVISION

THE BABCOCK & WILCOX COMPANY

Tubular Products Division • Fittings Department

3839 W. BURNHAM STREET • MILWAUKEE 46, WIS.

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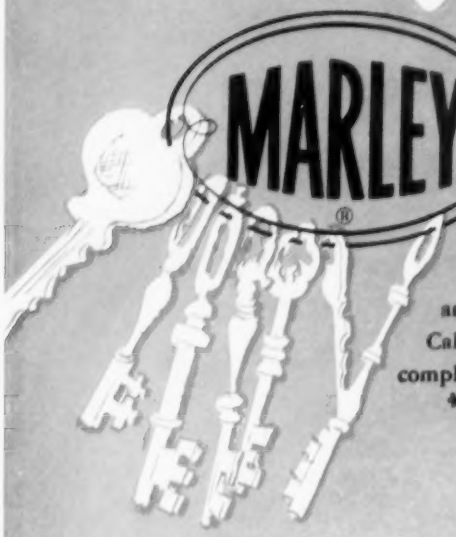
these 7 Keys open every door to



Water cooling has no "closed doors" this year. No matter what the problem, one of these 7 Marley cooling towers is the key. Special problems, such as tower location, fire codes, unusual corrosive conditions — all can easily be met and mastered with one of these '56 Marley cooling towers.

Marley towers cover the water cooling front — meet every service condition and capacity requirement. They're available when and where you need them, for stocks are maintained in all sizable cities. Call your reliable Marley distributor for information on the world's most complete line of water cooling towers for air conditioning and refrigeration.

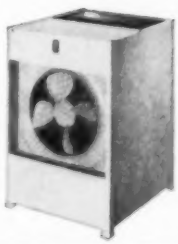
*Marclad Finish is standard on all '56 steel Aquatowers. This high-temperature, thermo-setting plastic defies the corrosive effects of acids, alkalies, water — insures a longer and happier service life than any other packaged cooling tower!

AQUATOWERS® (large capacity)

Models 4220 through 4250 provide the full performance water cooling ability and long service life essential to commercial refrigeration and air conditioning application. Fabricated of heavy gauge steel, ruggedness and durability are apparent in the construction of these towers. Their design incorporates a new ease of assembly and disassembly whenever required. These features plus operating and maintenance simplicity make them the first choice of discriminating buyers.

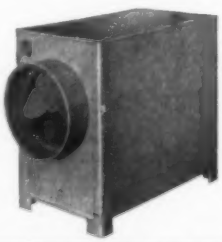
AQUATOWERS® (medium capacity)

Models 4105 through 4115 run the gamut of intermediate capacity applications. These completely welded, heavy gauge steel units come fully assembled for easy field application. Highlight features include MarClad® finish . . . readily removable open distribution basin . . . quiet, deep-pitched fan . . . Marley lifetime nailless filling. Like other Aquatowers, they can be located indoors or out.

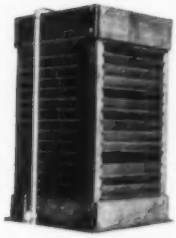


AQUATOWERS® (small capacity)

Models 4102 and 4103 are designed for 2 to 4 tons of refrigeration or air conditioning. Installation, operation and maintenance are extremely simple, yet these small models incorporate the high-performance design features of larger Aquatowers. MarClad® finish lends that adaptability and compatibility that is so appealing to owners.



Successful Water Cooling



SPRATOWERS® (Natural Draft)

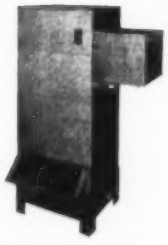
There is nothing like a Marley Spratower for water cooling installations where minimum initial investment and lowest operating costs are essential. '56 Marley Spratowers incorporate a new super-spray system that achieves maximum water break-up and air-water contact. They are fabricated of select heart quality California redwood and shipped disassembled. Available in 11 air conditioning and refrigeration sizes.

WOOD AQUATOWERS® (small)

Structural durability is outstanding in these all-wood towers produced in 5 models for service requirements of 3 through 15 tons. Ships factory-assembled for easy installation. Designed specifically for localities with high corrosion incidence, the forced draft design permits location of mechanical equipment out of the hot, humid air stream.

WOOD AQUATOWERS® (large)

These all-redwood towers with heavy asbestos cement board casing are designed for longest service life under most corrosive operating conditions. Applicable to all services from 20 to 50 tons, they make use of forced-draft and cross-flow principles. Air discharge is vertical, making this tower applicable to many restricted locations. Ships disassembled; easily hoisted and erected.



AQUACOOLERS®

This induced draft-counterflow tower was designed primarily for indoor installation, but is equally adaptable to outdoor service. Available in 5 sizes with capacities from 3 to 15 tons, the Aquacooler uses both pressure spray and MarPak® nailless filling to achieve maximum water break-up, longer air-water contact, higher performance.

"Nothing cools as well as water. . . nothing cools water as well as a Marley cooling tower"

The Marley Company

Kansas City, Missouri

MARLEY

This plant is safer since they put these Crane valves on hazardous fluids

THE CASE HISTORY—How safely you handle hard-to-hold combustible fluids can depend on the valves you use. Read how a large Midwestern printing and binding plant, by changing to the right valves, encouraged employee care and safety while stopping hazardous leakage and waste.

The plant's supplies of kerosene, naphtha, benzol and similar fluids were stored in a fireproof room. But the danger was in the constant dripping and leakage at the tanks.

The original pump apparatus on the drums was discarded and ordinary valves were installed for drawing supplies. Still the hard-to-hold fluids dripped and leaked—through the valve packing and stuffing box, and at the seats. Fluids were lost . . . the high maintenance costs continued . . . and the unsafe conditions remained.

Changing to Crane No. 130 brass valves on the drum outlets stopped all previous trouble.

To-date they've given more than a year of leak-free, maintenance-free service. These valves have special features for handling light oils, gases and volatile fluids.

Underwriters' Laboratories approved for LP-gases, Crane No. 130 valves have a composition disc soft enough for tight seating, yet stiff and resilient to take hard wear. The disc, cemented in its holder, prevents around-the-disc leakage. The stuffing box with molded asbestos packing is extra deep for durable stem sealing.

No. 130 valves are typical of Crane quality and value, and the complete selection you have in the Crane line in valves and fittings for every flow control need.

You'll find that specifying and ordering Crane materials will lead to lower ultimate costs for your piping equipment.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

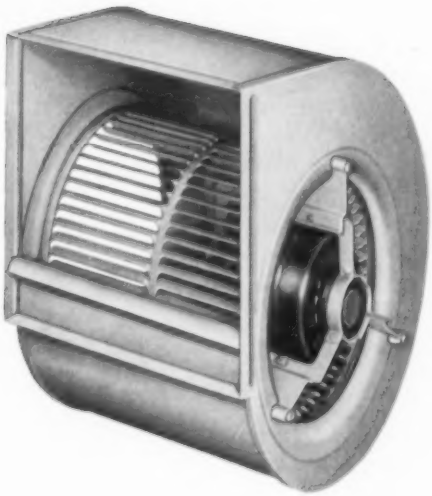
Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

STRONG

SILENT TYPE

NEW DIRECT DRIVE BLOWER FOR HEATING-COOLING COMBINATIONS

For some time there's been a *quiet* revolution afoot at Utility. And manufacturers of heating, cooling, refrigerating and ventilating equipment are solidly behind it. Newest creation of this passion for silence is a burly brute of a direct drive blower. We call it "Big Boy," newest of a new breed—the strong, *silent* type.



With airflow capacity great enough to handle up to 125,000 BTU—3-ton heating-cooling combinations, "Big Boy" will deliver approximately 1,400 to 1,500 CFM at a static pressure of 0.80" WG to make it the most powerful direct drive blower now available. Yet, low outlet velocity makes it ideal for residential units. Extremely compact, and easily speed-controlled, it is equipped with Neoprene hubs and super-quiet permanent split capacitor motor to give the sales appeal of silence to your equipment.

For quality you can count on, check Utility's silent "Big Boy" Direct Drive Blower. In blowers and parts, you'll always find that . . .

YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE!

A DIVISION OF UTILITY APPLIANCE CORP.

UTILITY FAN CORP.

911 East 59th Street, Los Angeles 1, California

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

Carrier again makes news

Exclusive

new refrigerating machine cools with steam

for big building air conditioning . . . for process cooling in industry . . .

From Carrier—first name in air conditioning—now comes a new absorption refrigerating machine.

IT COOLS WITH STEAM!

Cools with steam—and CUTS COSTS! Low-cost steam is the energy source. Electricity is needed only for small pumps and controls.

Cools with steam—and OPERATES AUTOMATICALLY! You push a single button in the morning and electronic controls take over. Push the button at night and the system shuts down. As simple as that! All day long the machine follows the rise and fall of the load without need for a highly trained operator.

Cools with steam—and SAVES SPACE! The Carrier Absorption Refrigeration Machine is so light you can locate it wherever you have space to spare. On the roof. In the basement. Anywhere in between. Installs easily. No heavy foundation needed.

Cools with steam—and FOLLOWS FLUCTUATING LOAD! Meets minute-to-minute needs from full load to zero capacity. And it can't be damaged by overloads.

Cools with steam—and IT'S SAFE! Water is the refrigerant. A simple salt is the absorbent. Nothing could be safer.

Cools with steam—and it GIVES YOU CARRIER DEPENDABILITY! Designed to give reliable, trouble-free service. Around the clock. Around the seasons.

Find out about *all* the advantages of exclusive Carrier Automatic Absorption Refrigeration. For your copy of the 36-page Carrier booklet that answers all the questions you could ask, call the nearest Carrier office. Or write Carrier Corporation, Syracuse, New York.

Carrier

air conditioning
refrigeration
industrial heating

SMALL HOSPITAL INSURES

Ideal Temperatures

Waste-Free Heating and Cooling

with JOHNSON CONTROL

The new 45-bed St. Joseph Hospital* in Del Norte, Colorado, is an excellent example of the modern approach to the problem of temperature and humidity regulation in the smaller hospitals. The correct solution to that problem is a system of Johnson *Individual Room* Control engineered to meet the exact needs of the individual building.

AIR CONDITIONED AREAS

At St. Joseph's, in the air conditioned operating and delivery sections, optimum temperatures are maintained constantly by strategically located Johnson Thermostats in each individual room. The humidity of the conditioned air is also controlled at all times by Johnson Room Humidostats. Complete safety, *even in the presence of explosive anesthetic gases,* is assured by the use of pneumatic control apparatus.

HEAT REGULATION

During the heating season, Johnson *Individual Room* Thermostats control Johnson Valves on convectors to insure the exact temperature desired in all other rooms of the building, including all patient rooms, offices and public areas. Comfort control is also provided on the building's unit ventilators.

In addition to *individual room* control, behind the scenes other Johnson Thermostats, Valves, Dampers and other controllers regulate the basic operation of the heating and air conditioning equipment. All apparatus is combined into a single, highly efficient system that not only provides the finest in individual room temperature regulation but accomplishes all this at the lowest possible heating and cooling cost.

In hospitals everywhere—and in all other types and sizes of buildings, new or existing—Johnson Control automatically insures the ultimate in comfort, convenience and economy. Each Johnson System, like the one in St. Joseph's, is planned to meet the exact needs of the individual building.

Next time you have a temperature or humidity control problem, talk it over with an engineer from a nearby Johnson branch. He draws on the more than 70 years' experience of the only nationwide organization devoted exclusively to planning, manufacturing and installing automatic temperature control systems. His help is yours for the asking. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

**St. Joseph Hospital, Del Norte, Colorado. Thomas & Sweet, architects, Colorado Springs; K. J. Murray, mechanical engineer, Denver; Howard Whitlock Construction Co., general contractor, Pueblo; Brickham & Tomberlin, mechanical contractor, Denver.*

JOHNSON CONTROL

TEMPERATURE AIR CONDITIONING

PLANNING • MANUFACTURING • INSTALLING • SINCE 1885

NEW HI-VALVE Aircoustat

Quiets ALL Noise in High Velocity Systems

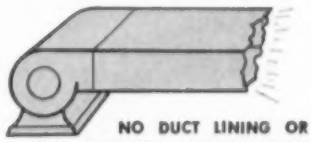
COMBINES QUIET PRESSURE REDUCING VALVE WITH REVOLUTIONARY AIRCOUSTAT SILENCER IN ONE ENGINEERED PACKAGE

Here at last is the practical, economical solution to the three noise problems which have plagued consulting engineers and contractors on all high velocity air conditioning systems: fan noise, valve noise and duct noise.

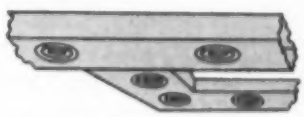
Specially designed and acoustically engineered to provide *complete* noise attenuation, Hi-Valve Aircoustat combines a silent flow pressure reducing valve with the jet engine type Aircoustat silencer which has revolutionized the air conditioning field.

Easily installed in branch ductwork ahead of the diffusers, Hi-Valve Aircoustat eliminates the need for expensive duct line mufflers and high velocity diffuser units . . . effecting substantial savings in space and on equipment and installation costs.

Write for complete information on Hi-Valve Aircoustat . . . the space-saving "all-in-one" unit which is engineered to take the guesswork out of High Velocity System silencing.



NO DUCT LINING OR HIGH VELOCITY DIFFUSER UNITS



HANDLES UP TO 3,000 CFM

Hi-Valve Aircoustats are installed directly in the ductwork, eliminating the need for duct lining and high velocity diffuser units. Because of the high capacity, a single unit can handle silencing and pressure reduction for up to 3,000 C.F.M. and is adaptable to split systems as well as single diffuser operation.

Use of easy-to-install Hi-Valve Aircoustat eliminates hit-or-miss silencing . . . assures complete attenuation and accurate pressure control.

Versatile Hi-Valve Aircoustat is available for small-duct systems and is readily adaptable to pneumatic control.

Quiets All 3 Noises with a Single Unit
Hi-Valve Aircoustat provides acoustically engineered, single-unit silencing of *all* high velocity system noises: fan noise, valve noise and duct noise.

Mail this coupon TODAY ▶▶▶

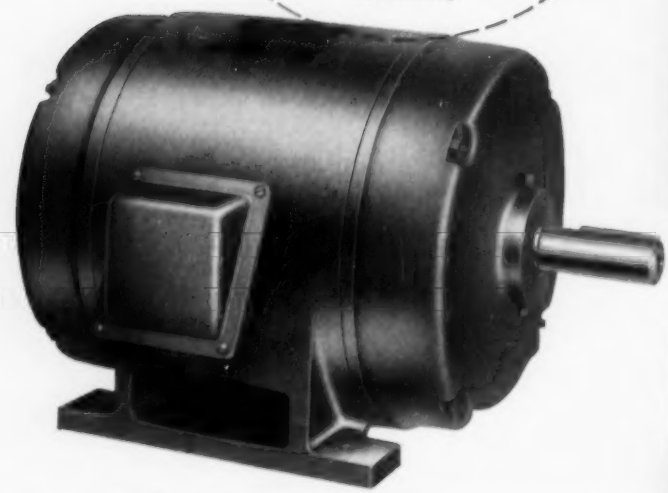
INDUSTRIAL SOUND CONTROL, INC.
45 Granby St., Hartford 12, Conn.
Please send me more information on Hi-Valve Aircoustat.

NAME _____
TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

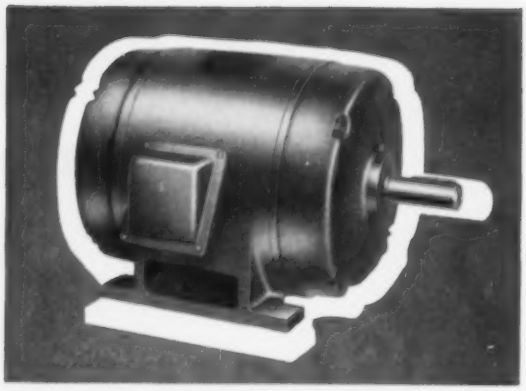


You get better performance with these Wagner DP Motors

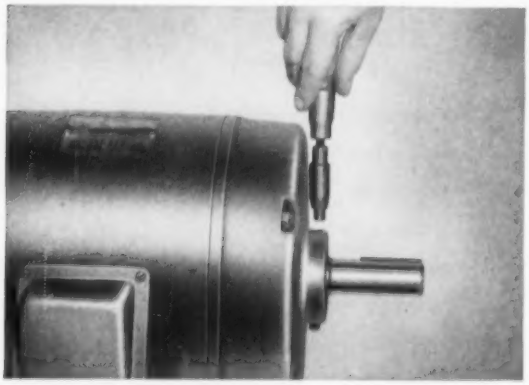
Wagner DP motors are *doubly protected* by (1) rugged, corrosion-resistant cast iron frames, smoothly rounded so that no moisture can collect on them. Motor feet are cast as an integral part of the frame for maximum strength and rigidity. (2) Enclosures on the DP motor are completely drip-proof—virtually splashproof. Air intakes are located at the bottom of the endplates and air outlets are located at the base of the frame—one on each side.

Although engineered to meet the re-rated NEMA specifications which call for more power in smaller frames, the same high quality and long life performance that have made Wagner Motors "the choice of leaders in industry" for many years has of course been retained.

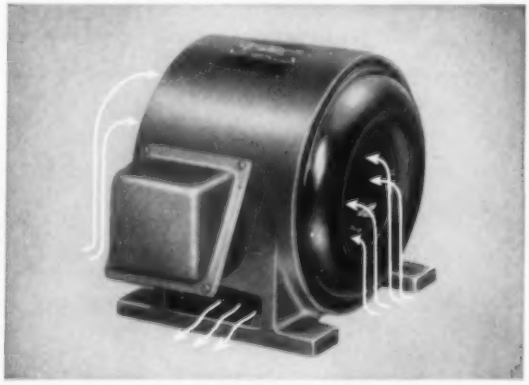
Full information and principal dimensions are given in Bulletin MU-202. Write for your copy today.



MORE POWER IN SMALLER FRAMES The Wagner DP Motor packs more power in a smaller frame and this smaller size means ease of handling and stocking . . . less space required for installation.



CAN BE RE-GREASED FOR LONGER LIFE This motor will operate for years without regreasing . . . bearings are completely enclosed . . . however, provisions have been made for adding lubricant and for the removal of old grease in cases where re-greasing is necessary.



COOL RUNNING Specially designed baffles direct cooling air from the blowers through the motor and provide protection for the stator windings. Blowers are an integral part of rotor . . . and move large volumes of air without noise or vibration.

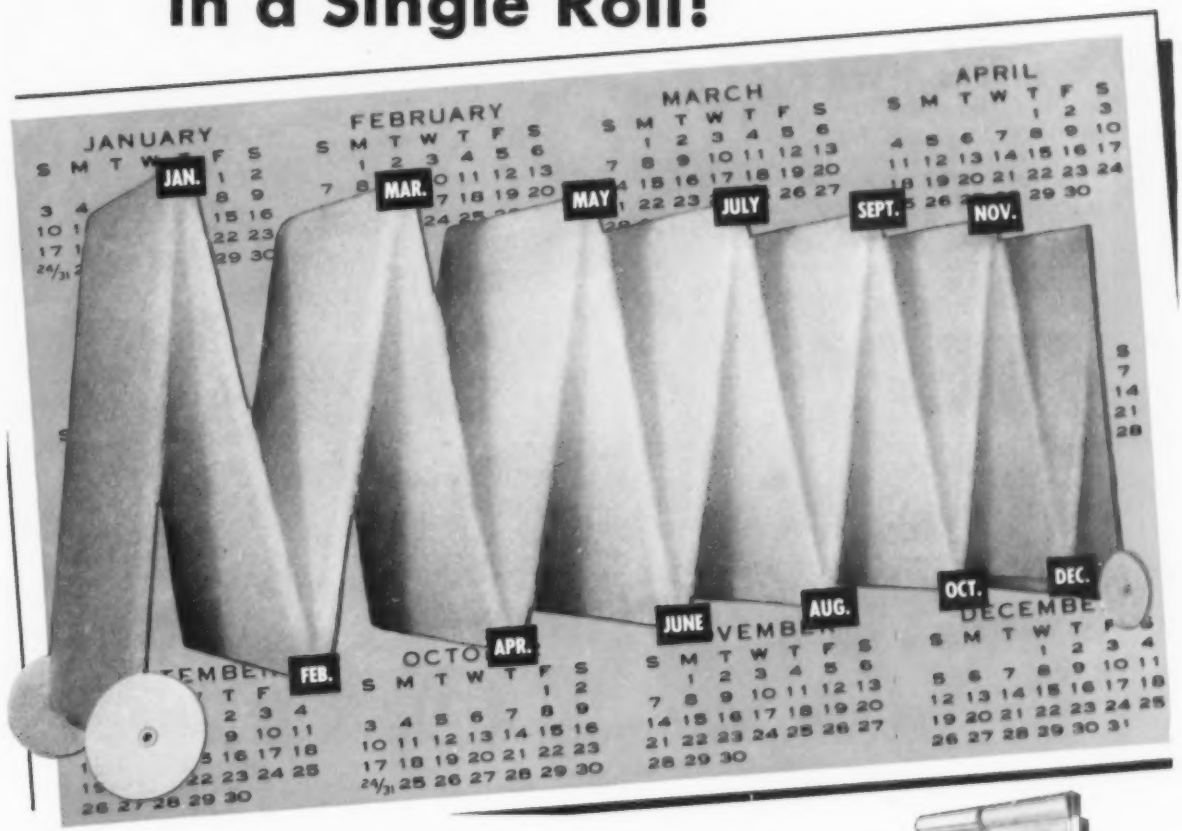
Wagner Electric Corporation
6370 Plymouth Ave., St. Louis 14, Mo., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

M50-4

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

Year's Supply of Clean Air in a Single Roll!



Self-servicing ROLL-O-MATIC reduces filter maintenance to an annual event

It's just this simple. The above filter curtain, when installed in a ROLL-O-MATIC section up to 11 ft. high (18,000 cfm), represents a full year's supply of media under normal operating conditions.

Naturally, this is no ordinary filter curtain. It's a "blanket" of bonded glass fibers 5 ft. wide and 65 ft. long. But, presto—when wrapped on a spool it becomes a roll only 13" in diameter. Its cost—about half that of disposable filters of equal capacity.

Installation and operation of this media is much like that of a roll of film in a camera. Mounted at top of the ROLL-O-MATIC, it moves as a curtain down the face of the filter and is re-rolled at the bottom. Movement to maintain desired operating resistance is controlled by an automatic timer.

Is it practical? Scores of ROLL-O-MATICS are already in service rolling up new records for low cost, maintenance-free operation. Ask your local American Air Filter representative for ROLL-O-MATIC Bulletin No. 248.

AAF Dust Control Equipment

Illinois Steam Heating Specialties

AAF Herman Nelson

American Air Filter
COMPANY, INC.
373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

BETTER AIR IS OUR BUSINESS

Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators

LEADERS RELY ON LAU
25 Years Building Better Blowers
In the heating and air-conditioning fields Leaders Rely on Lau as the major supply source for the best in air-moving equipment. On this, our Silver Anniversary Year, many new developments are in the offing. And, as advancements in design and engineering have been proved by exhaustive tests, Lau will bring them to the industry.

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THE LAU BLOWER COMPANY

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Other plants at Kitchener, Ont., Canada, and Azusa, California

Our exclusive LAU-pak Gold Seal Bearings solve many problems. There are NO oil cups, NO oil tubes and NO servicing. As a matter of fact *these* sealed bearings are lifetime lubricated in the bearing housing of all Lau Series "A" belt drive Blowers. There is no need for access doors, the blower may be positioned at any angle, the operation is smooth and quiet; and friction is largely eliminated. Thus, with LAU-pak Gold Seal Bearings you are assured of lifetime service in normal usage. Lau also makes large capacity oil reservoir bronze bearings with spring pressure. You can depend on LAU quality. Write Lau today, Dept. M.

LB-3, 56

WORLD'S LARGEST MANUFACTURERS OF AIR-CONDITIONING BLOWERS

Here it is...!

THE NEW "48-FRAME" MOTOR DESIGN THAT GIVES YOU Century INDUSTRIAL QUALITY

Everything you asked for and more. Smaller, yes... and better, too. Here is traditional Century dependability, smooth-running and quietness under load... now skillfully engineered into the compact new "48-Frame" design.

These great new Century "Industrial Quality" motors are now available in sizes from 1/20 to 1/3 H.P.... developed specially for industrial users.

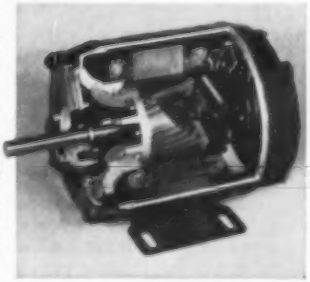
ON NEW EQUIPMENT OR FOR REPLACEMENT...

when you see the red "C" on the new weight-saving, space-saving "48-Frame" motors, you're assured of Century's *traditional industrial ruggedness*. For information and for fast service, call or write your nearby Century District Sales Office or Authorized Distributor.

We Invite Your Comparison of...

engineering — Weight savings up to one-third are made possible without "skimping" on the vital "active materials", simply by eliminating dead weight and using new materials. The result is smaller-diameter motors that are not merely "just as good" but actually superior to the famous Century "56-Frame."

design—For time-saving maintenance, "GITS"-type oilers for sleeve bearings are placed high on the end-brackets, allowing easy oiling from either end of the motor... cluster-type integrally cast fan at the rear end of the rotor draws a steady stream of cooling air over the coilheads... "Square" stator iron permits air to pass between the core and shell, cooling the whole width.

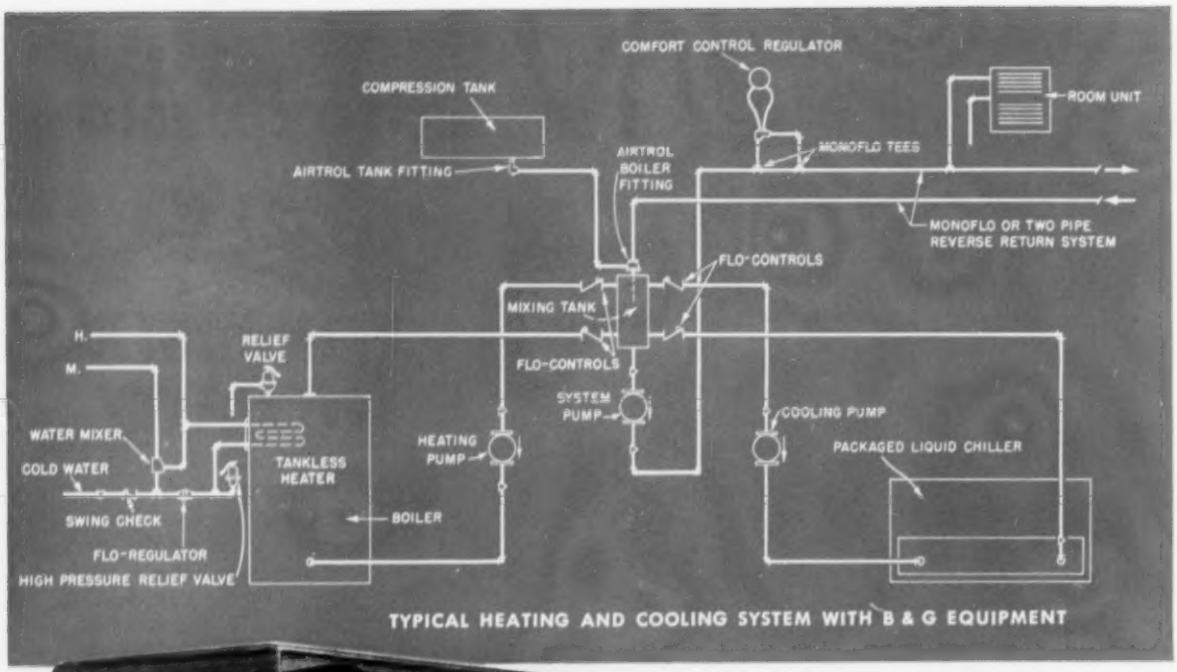


Performance-Rated© MOTORS
1/20 to 400 H.P.

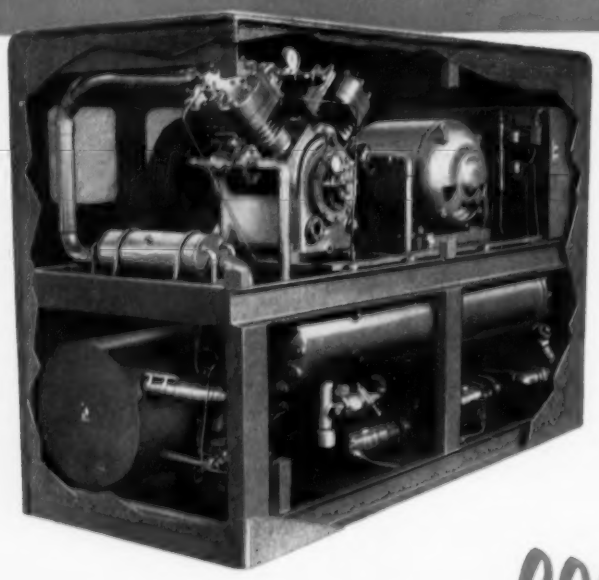
CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

56



TYPICAL HEATING AND COOLING SYSTEM WITH B & G EQUIPMENT



VIRTUALLY A PLUG-IN UNIT...
7½ TO 100 TONS CAPACITY

The B&G Package Liquid Cooler offers an impressive array of features for more efficient performance and easier installation. For example, the low pressure drop through the evaporator permits a substantial reduction in system pump sizes. The evaporator is under the compressor, for a lower center of gravity, easier installation and service. Pump-down is non-recycling...and an integrated electrical control system provides a high degree of automation without extra cost. Wiring is complete, including that of the chiller and tower pump.

This is a B&G Product...built to the high standards which make the B&G label a warranty of satisfaction.

A COMPLETE *cooling package*

Stock pumps and cooling components for immediate shipment

No need now for delays on the job because of missing material. For your convenience, a stock of most commonly used sizes of refrigeration and air conditioning components is maintained at the B&G factory for immediate delivery. These units include Centrifugal Pumps, Condensers, Liquid Receivers and Heat Exchangers. Just write, phone or wire!

Send today for a complete file of B&G literature on factory stock items.

For complete data on the B&G Package Liquid Cooler, ask for Catalog HB-755.

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COMPANY
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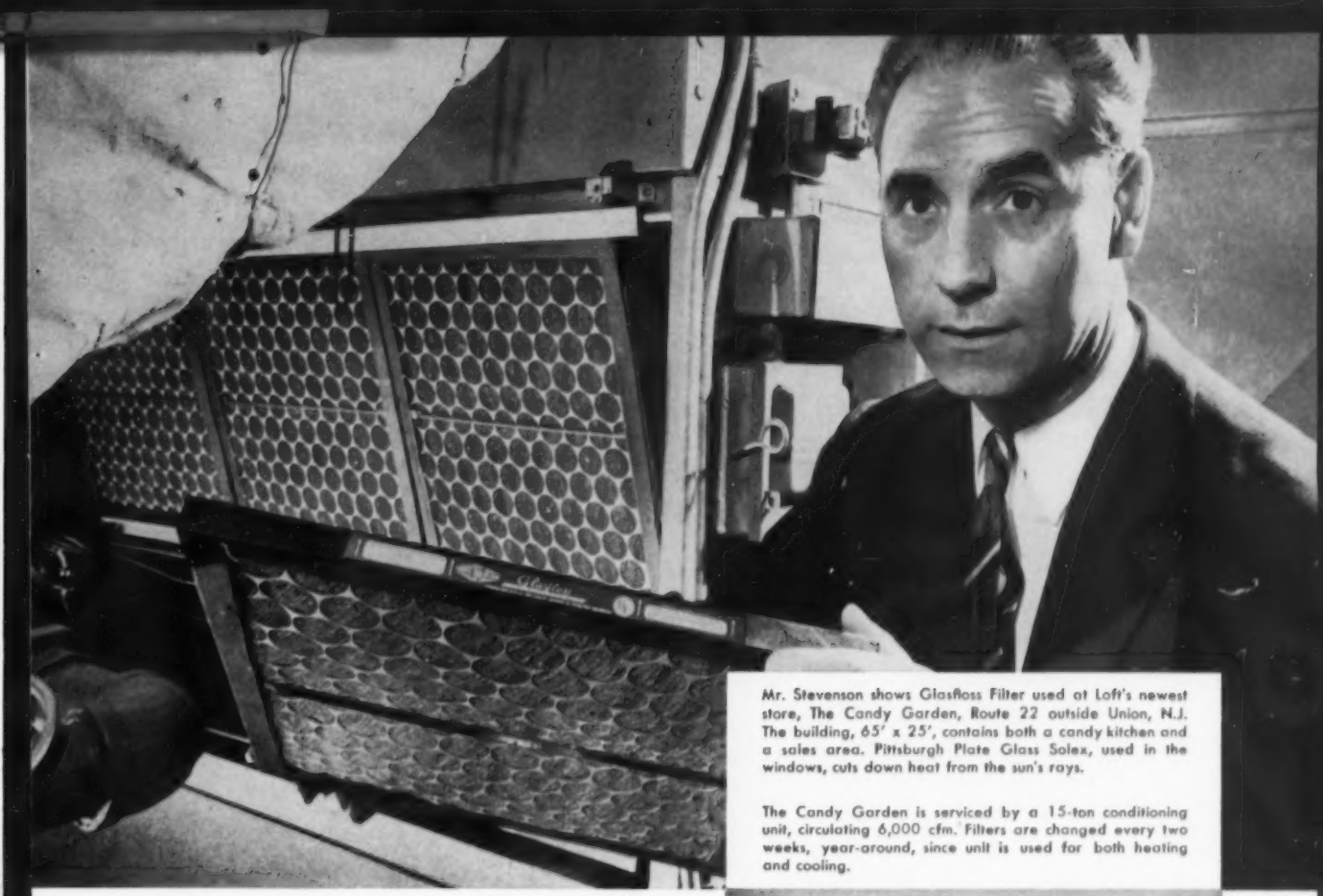
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, W. Toronto



Mr. Stevenson shows Glasfloss Filter used at Loft's newest store, The Candy Garden, Route 22 outside Union, N.J. The building, 65' x 25', contains both a candy kitchen and a sales area. Pittsburgh Plate Glass Solex, used in the windows, cuts down heat from the sun's rays.

The Candy Garden is serviced by a 15-ton conditioning unit, circulating 6,000 cfm. Filters are changed every two weeks, year-around, since unit is used for both heating and cooling.

"Glasfloss Air Filters cost us less to use . . . provide more efficient service"

reports Thomas Stevenson
Loft Candy Corporation's Director of Maintenance

Air conditioning and cleanliness are paramount in the business of selling candy to the public. A constant temperature of 70 degrees year-around is needed to preserve the shape, taste and appearance of freshly made chocolates; candy shop interiors must always be spotless to attract and keep customers.

In Loft Candy Corporation's 200 stores, air conditioning maintenance and air filtering have been materially improved by using Glasfloss Air Filters. Short, brittle glass fibers no longer clog air conditioner condensate lines and drains. Elaborate maintenance procedures made permanent metal filters impractical for the firm's use.

"The Glasfloss Filters can be, and often are, changed by our sales girls," Mr. Stevenson explained. "They are also lightweight, easy to insert in the conditioning units, and long-lived because they filter in depth . . . that is, the dirt particles don't just encrust the surface. They are absorbed by the body of the filter."

There you have the important reasons why Glasfloss Air Filters are importantly different from conventional fiber glass or glass wool filters. Long, silky Glasfloss fibers are kind to the hands. Glasfloss offers less air resistance, holds more dust and dirt, doesn't surface load. In daily operations, these features mean dollars and cents saved in your office, store, plant or building. For more information, write Glasfloss Dept., Fiber Glass Division, Pittsburgh Plate Glass Co., One Gateway Center, Pittsburgh 22, Pa. Ask for a copy of Bulletin #455.

GLASFLOSS IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

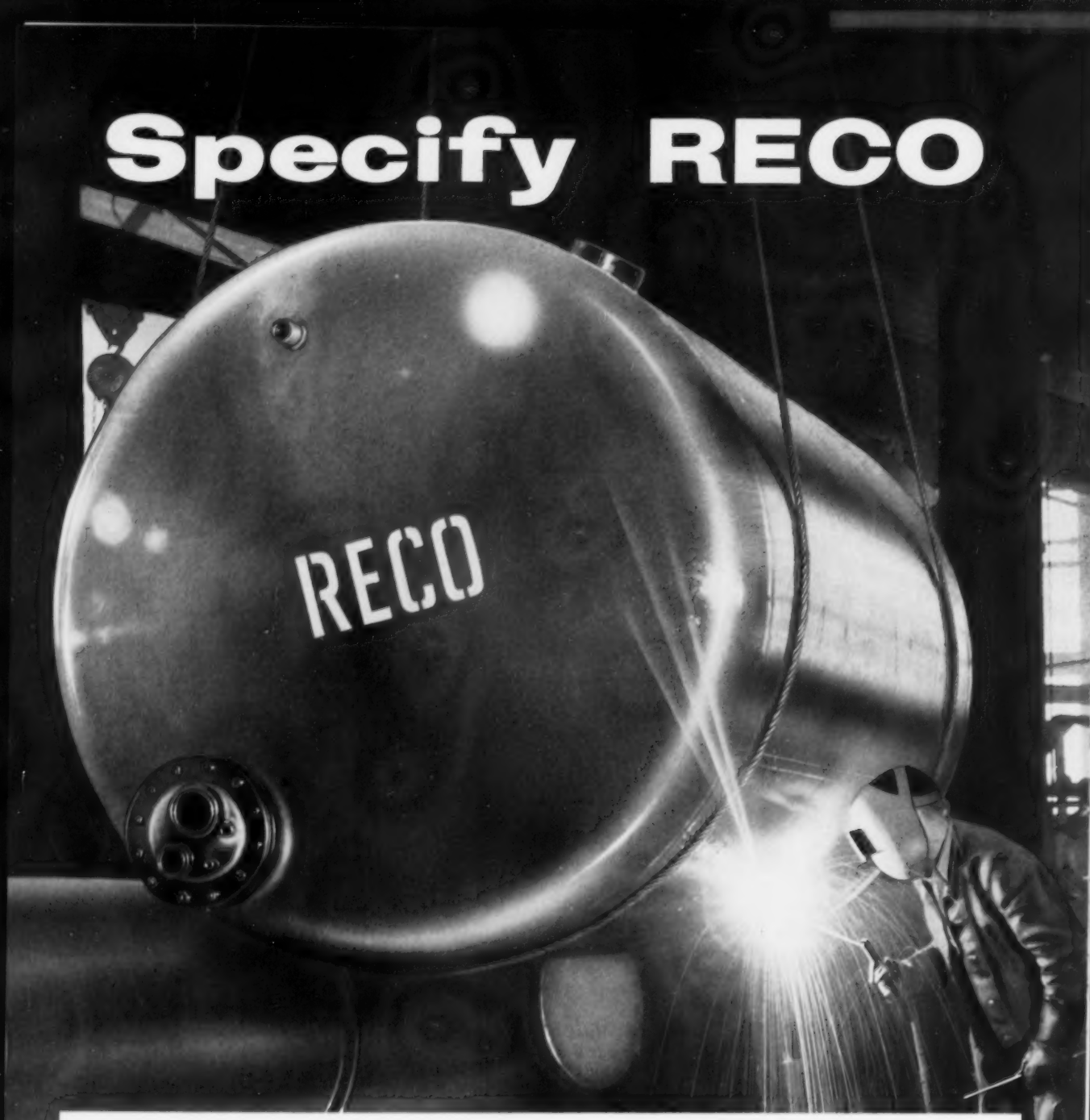
Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

FIBER PG GLASS

PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

Specify RECO



RECO HOT WATER STORAGE HEATERS MET GOVERNMENT SPECIFICATIONS FOR QUALITY for Bldg. No. 10, National Institutes of Health. RECO backed up their quality with the right price and guaranteed delivery on schedule. For years of trouble-free hot water service, specify RECO HOT WATER STORAGE HEATERS.

Building 10, National Institutes of Health, Bethesda, Md.
Designed by - Public Buildings Service, Wash., D.C.
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RECOgnized for superior quality in 48 states and 16 foreign countries.

RECOmmended by leading engineers, contractors and architects.

RECO Hot Water Storage Heaters, Convertors and Instantaneous Heaters.

For free catalogs and the name of the RECO Representative nearest you, write:
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Richmond Engineering CO., Inc.

THE MARK OF QUALITY

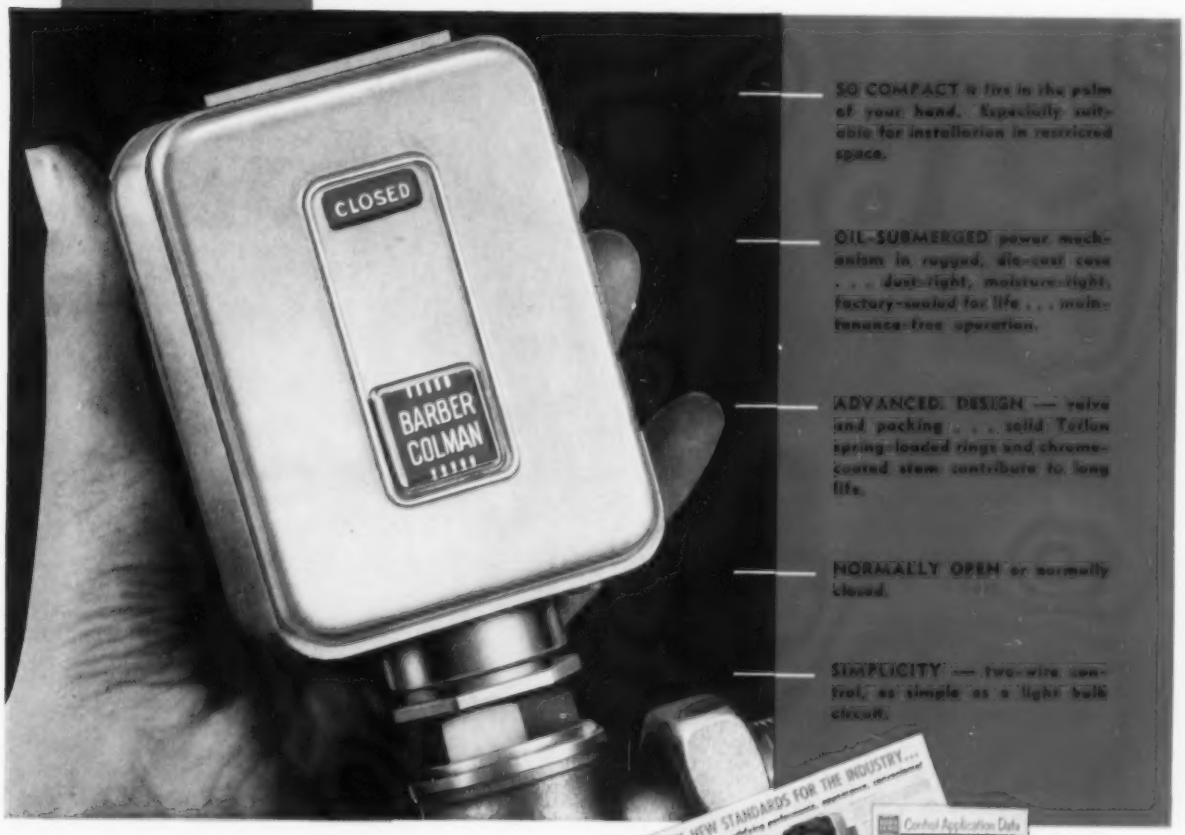
BARBER COLMAN

ELECTRIC-ELECTRONIC

Automatic Controls

New... compact... motor-operated valve!

Here's your simplest, most economical way to control convectors, radiators, unitary air conditioners . . . using hot water, low-pressure steam, or chilled water. It's the new, field-tested, extremely compact, motor-operated Barber-Colman valve which is making news throughout the industry. Look at these years ahead features:


CLOSED
BARBER COLMAN
SO COMPACT it fits in the palm of your hand. Especially suitable for installation in restricted space.
OIL-SUBMERGED power mechanism in rugged, die-cast case . . . dust-tight, moisture-tight, factory-sealed for life . . . maintenance-free operation.
ADVANCED DESIGN — valve and packing . . . solid Teflon spring-loaded rings and chrome-coated stem contribute to long life.
NORMALLY OPEN or normally closed.
SIMPLICITY — two-wire control, as simple as a light bulb circuit.

Now you can recommend simplified, effective, *individual room control* for schools, offices, hospitals, apartments, hotels, motels, etc. This compact new valve can be installed throughout new or existing buildings, or in just a room or a floor at a time. Owners can expect substantial fuel savings, reduced decorating costs, satisfied tenants. Occupants will enjoy new controlled comfort in each room, contributing to health and efficiency. Get complete information now from nearby Field Office or write us.

YOU SHOULD HAVE this catalog and control application data. Phone your Barber-Colman Field Office or write us for Bulletin F-6801 and Control Application Data CA-12.

Barber-Colman Company

DEPT. B, 1301 ROCK STREET
ROCKFORD, ILLINOIS, U. S. A.

NOW G-E CEILING-MOUNTED PACKAGED AIR CONDITIONERS HELP YOU

SOLVE 2 PROBLEMS

1 SPACE

Now your scope of design can include the finest air conditioning without using a foot of vital floor space. Because new G-E Packaged Air Conditioners are fastened to the ceiling—or can be mounted on a shelf. And these trim units enhance any modern scheme. They're compact, self-contained—with no exterior parts. Motor, compressor and condenser are all sealed inside.

2 WATER

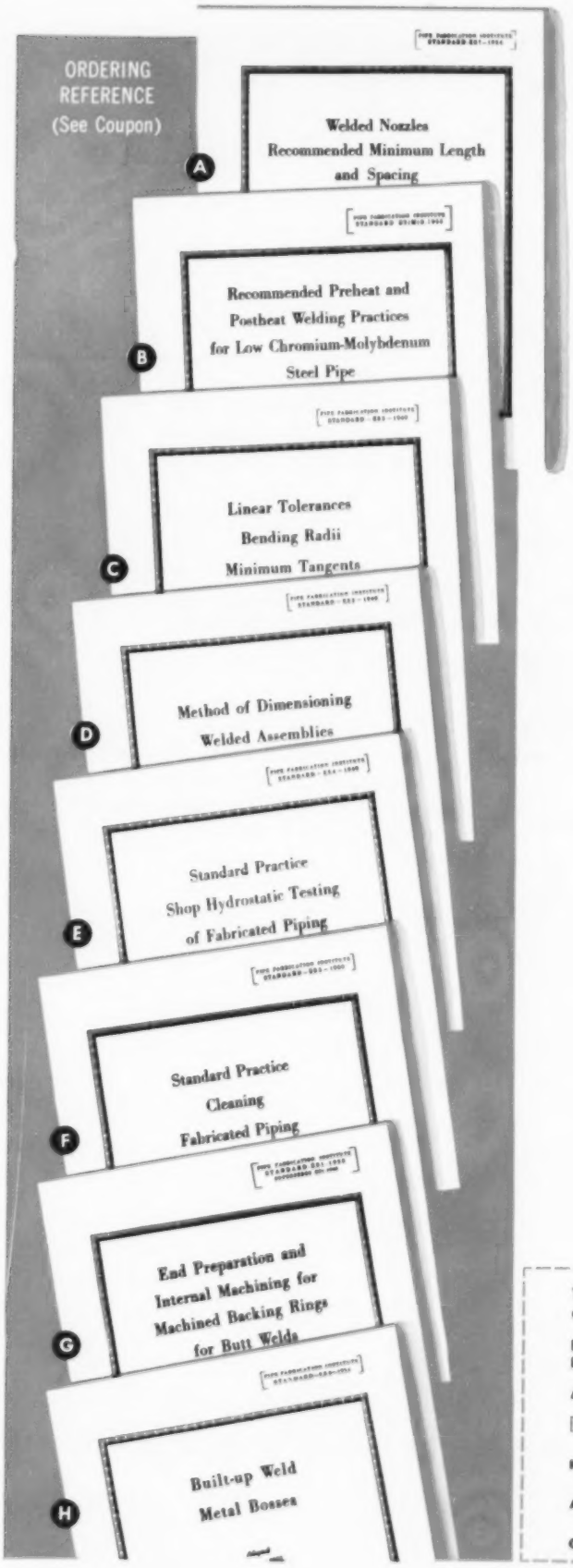
Where water restrictions present a serious problem, specify G-E ceiling-mounted units in air-cooled models available in 3 and 5 ton capacities. These models use no water—require only air and electricity. Water-cooled models also available in 3, 5 and 7½ ton capacities. For *year-round* comfort, all new G-E ceiling-mounted units may be equipped with coils for winter heating.

And, remember! G-E is the only complete packaged air conditioning line on the market. You can specify both floor- and ceiling-mounted models from a single manufacturer. For free booklet, "What Every Businessman Should Know About Weather Reflex", write General Electric Company, Commercial and Industrial Air Conditioning Department, Bloomfield, New Jersey.

Packaged AIR CONDITIONERS

Progress Is Our Most Important Product

GENERAL ELECTRIC



SAVE TIME
•
CUT COSTS
•
And Get BETTER PIPING by using THESE PFI STANDARDS

Good standards, understood and accepted by an industry, become a touchstone which speeds operation, improves product and reduces costs. The eight PFI Standards shown here were compiled by the Engineering and Standards Committee of the Pipe Fabrication Institute. They are now widely used by designers, fabricators, contractors and users of pressure piping. They often save time on the drawing board . . . expedite materials delivery . . . save time and money in erection. It all adds up to better piping quicker . . . and maximum value per dollar of cost.

These Standards are available without cost to anyone interested. Simply return the coupon or write on your company letterhead.

THE PIPE FABRICATION INSTITUTE

Devoted to the Technical and Economic Problems in Piping

One Gateway Center • Pittsburgh 22, Pa.

7365

THE PIPE FABRICATION INSTITUTE
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Please send me without obligation the PFI Standards I have circled below:

A B C D E F G H

☐ Check here for copies of all future PFI Standards.

NAME_____

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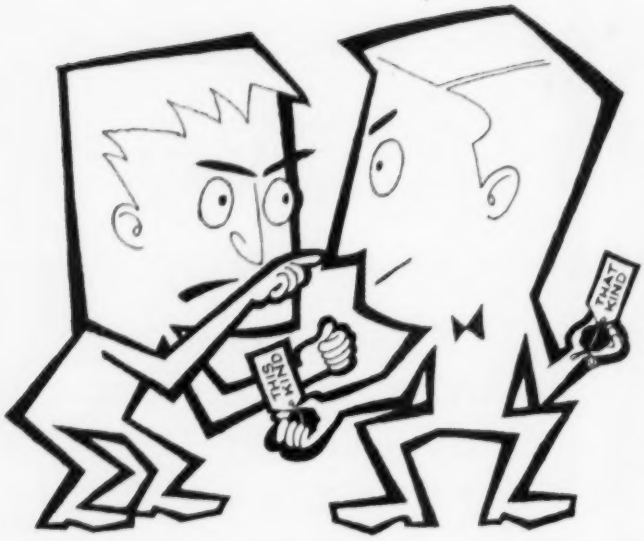
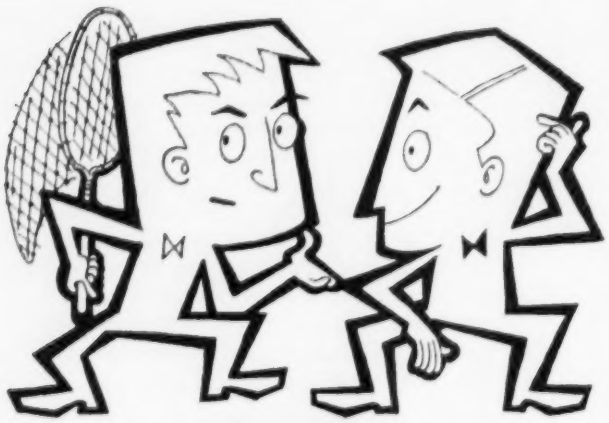


What's the big idea buying several kinds of coal for our steam plants?

It's a good idea. The kind of coal that burns most economically in the old boilers isn't efficient for the new ones.



How do you know you're right?

Look at the coal bills. We are generating more steam at a lower fuel cost. You can tell from the ashes we are getting more complete combustion, and there's less clinkering.

Where did you get this idea, anyway?

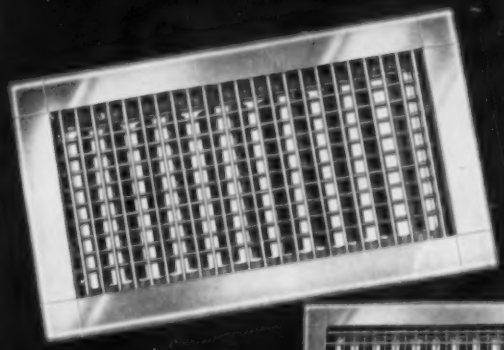
From the C & O Coal Department. They convinced us that different types of burning equipment need different types of coal. From the high quality coal produced on the C & O, we selected the quality and size of coal that works best in our particular installations.

P.S.

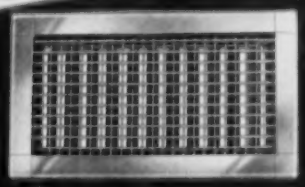
There's a lot more to buying coal than the cost per million BTU. Why not contact coal producers on the C & O to solve your particular fuel requirements, or write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake & Ohio Railway Co., Terminal Tower, Cleveland 1, Ohio, for the assistance of a C & O fuel service engineer.

Chesapeake and Ohio Railway

WORLD'S LARGEST CARRIER OF BITUMINOUS COAL



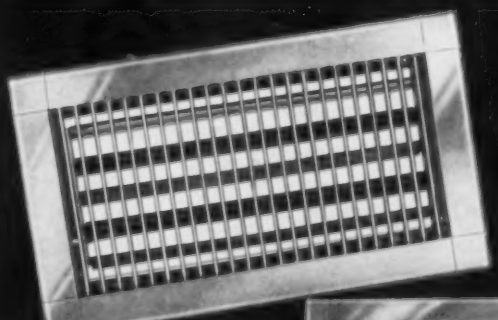
No. 92VHV — vertical front bars, horizontal second bank bars, vertical louvers.



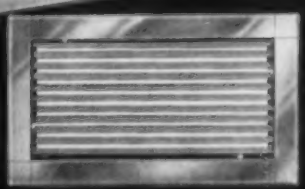
No. 92HVV — horizontal front bars, vertical second bank bars, vertical louvers.

MEMO:

For precise Heating and Cooling control, specify H&C registers and grilles in commercial installations.



No. 93V Register . . . vertical front bars set straight, horizontal louvers.



No. 94A Grille . . . horizontal face bars set at 22° angle for up or down deflection.

H&C TRIPL-AIRE

. . . designed to provide any air-flow pattern you require. Here's the basic line that includes 260 possible combinations of capacity and deflection characteristics. Twenty-six standard sizes, up to 36" x 12" . . . each available in ten variations to provide almost any imaginable combination of deflections in both horizontal and vertical planes . . . plus all intermediate sizes up to 36" x 36" available on order. Face bars and louvers are both adjustable from the front of the register, and opposed louvers permit absolute volume control with equal air distribution over entire face. Finished in top quality enamel . . . modern "Decorator Grey" standard. Get complete details from your H & C Jobber, or consult our current catalog.

H&C FIXT-AIRE

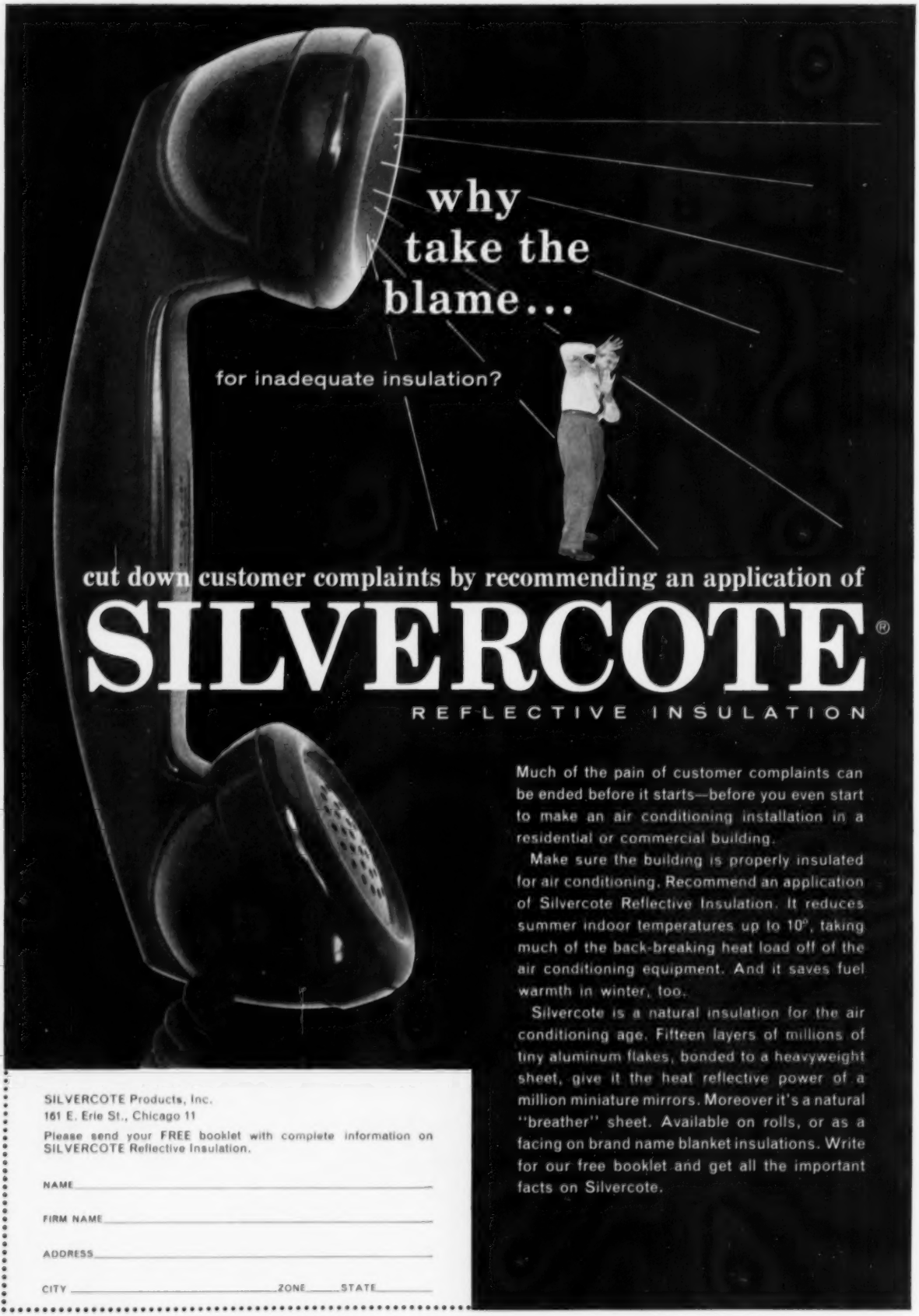
. . . matching return air registers and grilles. Perfect companions to the TRIPL-AIRE line, these FIXT-AIRE units are matched in quality, design, and finish. Registers feature the same positive volume control with opposed louver construction, and have a single bank of face bars in fixed vertical or horizontal position. Grilles are available with horizontal face bars set at 22° angle for up or down deflection where desired. Maximum one-piece size: 36" x 30".

COMPLETE CATALOG AVAILABLE

. . . with full engineering data . . . if your jobber can't supply you, write direct.

HART & COOLEY MANUFACTURING CO.

Dept. 2-AC HOLLAND, MICHIGAN



cut down customer complaints by recommending an application of

SILVERCOTE®

REFLECTIVE INSULATION

Much of the pain of customer complaints can be ended before it starts—before you even start to make an air conditioning installation in a residential or commercial building.

Make sure the building is properly insulated for air conditioning. Recommend an application of Silvercote Reflective Insulation. It reduces summer indoor temperatures up to 10°, taking much of the back-breaking heat load off of the air conditioning equipment. And it saves fuel warmth in winter, too.

Silvercote is a natural insulation for the air conditioning age. Fifteen layers of millions of tiny aluminum flakes, bonded to a heavyweight sheet, give it the heat reflective power of a million miniature mirrors. Moreover it's a natural "breather" sheet. Available on rolls, or as a facing on brand name blanket insulations. Write for our free booklet and get all the important facts on Silvercote.

SILVERCOTE Products, Inc.
161 E. Erie St., Chicago 11

Please send your FREE booklet with complete information on SILVERCOTE Reflective Insulation.

NAME_____

FIRM NAME_____

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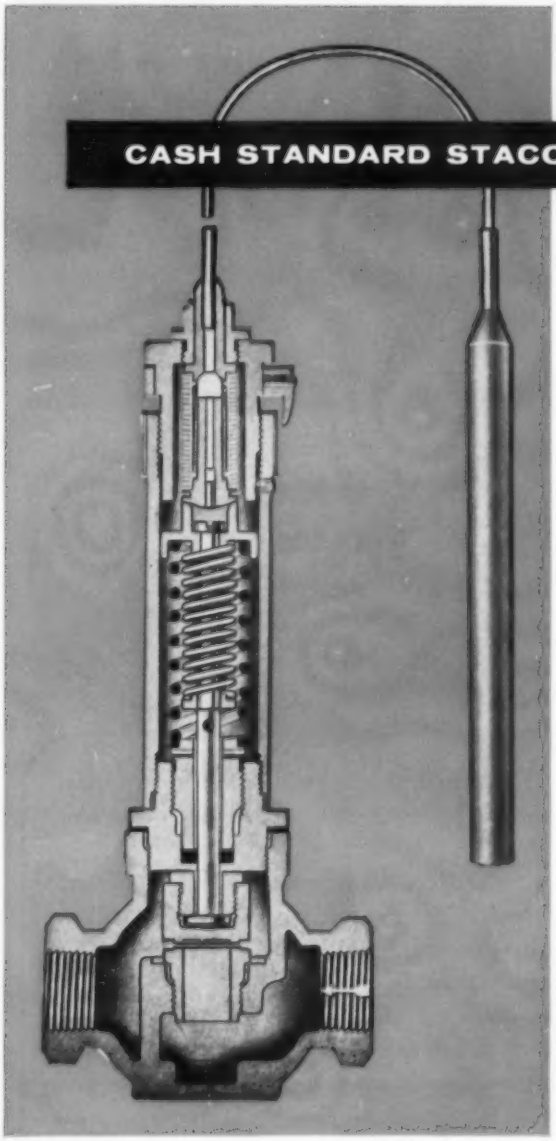
Cash Standard Expands

by the addition of

Stacon Temperature Regulators

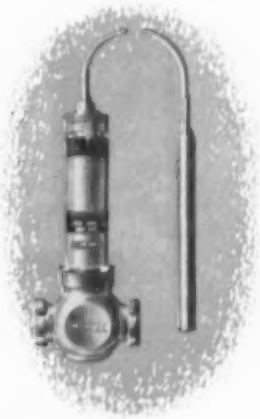


This line of temperature regulators (formerly manufactured by Farris Stacon Corp.) rounds out complete Cash Standard line of valves to solve any problem of temperature regulation or pressure control.

CASH STANDARD STACON TEMPERATURE REGULATORS

- Provide accurate temperature control for use with steam, liquids and gases.
- Self-operating and self-contained pilot-operating.
- Direct and reverse acting.
- Liquid filled thermal system for high operating power and uniform throttling action.
- Extremely compact construction with rugged field-replaceable thermostatic system.
- Overload protection to prevent overstressing of thermostatic system at over-range temperature.

Recommended for hot water heaters, tanks, kettles, plating tanks, bottle and can washers, degreasers, ovens, fuel oil heaters, brine circulating, process cooling, jacket cooling for compressors, diesel and gas engines, and many other uses.



What is *Your* Temperature Regulation Problem?

Cash Standard has the Answer!

Contact your Cash Standard control specialist or write Dept. B

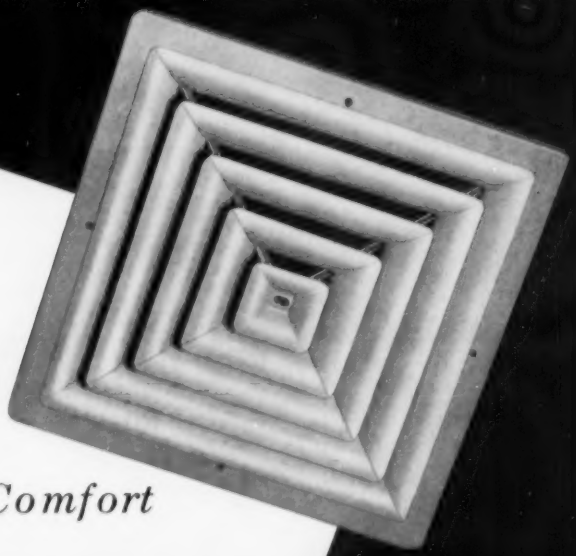
CASH STANDARD

A. W. CASH COMPANY, P. O. Box 551, Decatur, Illinois

Pressure, Hydraulic, Temperature, Process and Combustion Controls

2 Beautiful Ways

to assure Draftless Comfort



Lima Series 60

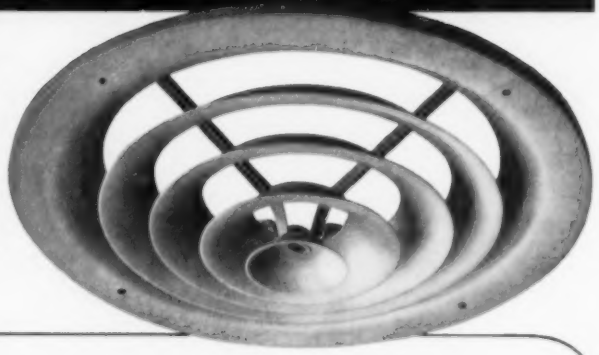
SQUARE STEP-DOWN CEILING DIFFUSER

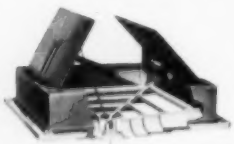
Matches the beauty and symmetry of modern square block ceilings for the finest commercial installations. Available in six sizes.

Lima Series 65

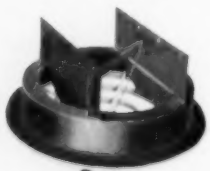
ROUND STEP-DOWN CEILING DIFFUSER

A new high in quality at a low unit cost, for economical commercial installations. Available in seven sizes.





Built-in spring-loaded butterfly dampers provide simple fingertip volume control and positive air shut-off. Lima "Balancing Bell" control feature for easier balancing.



Here's beauty that blends harmoniously with modern commercial interiors . . . and air handling performance that adds up to permanent satisfaction.

Styled to complement modern ceilings, Lima Ceiling Diffusers are engineered to assure draftless comfort in heating and cooling. Lima step-down vanes have curved contour without straight edge for maximum free area. Supply air is gently deflected outward and slightly downward for rapid diffusion in all directions at correct angle to induce aspiration of room air and eliminate ceiling streaks.

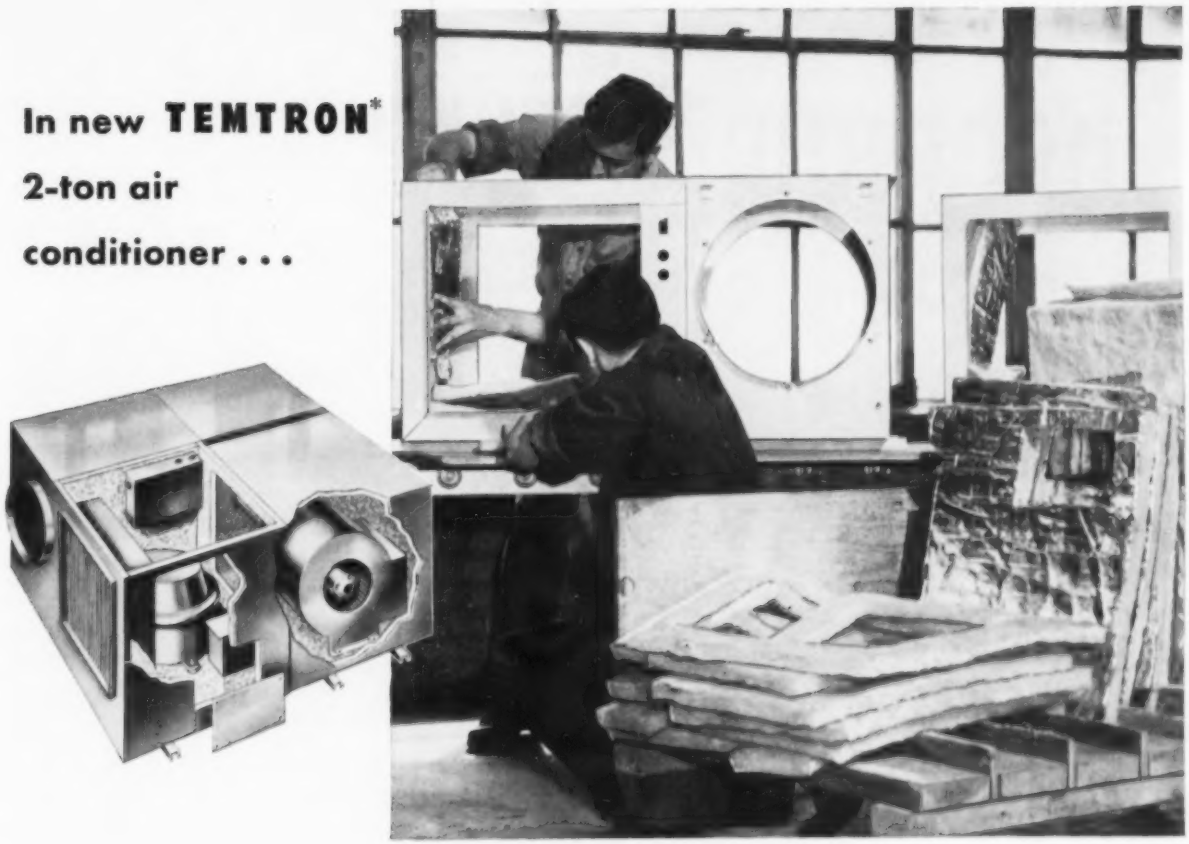
Installation is easy and quick. Four screws hold diffuser and built-in damper assembly to pipe duct. Balancing is simplified with volume control right in the diffuser. The attractive light beige finish is permanent and harmonizes with modern ceilings.

Lima Ceiling Diffusers and Dampers offer many advantages as return air outlets and vents, eliminating large unsightly grilles.

Write today for literature and specifications
Sold exclusively through heating wholesalers and manufacturers

Lima REGISTER CO., LIMA, OHIO

In new TEMTRON* 2-ton air conditioner . . .



Microlite® solves both thermal insulation and noise reduction problems

"Here's why all the insulation in the Temtron is Microlite," says James F. Brownell, Chief Engineer of the Ultrasonic Corporation's Air Conditioning Division.

"First of all, Microlite gives us the *high thermal efficiency* we need.

"Secondly, it is an *effective sound absorber*. The 1-inch thick Microlite used in the evaporator and blower sections of the Temtron help to prevent transmission of compressor and blower noises."

To build "two tons of refrigeration with the lowest operating cost in the field," the Temtron engineers took advantage of the basic economies resulting from use of Microlite.

Chief Microlite economy is the fact that it can be handled with speed and sureness. This results from its flexibility and high tensile strength. Microlite is inherently stronger because its glass fibers are longer. These longer fibers are made possible by L·O·F Glass Fibers' exclusive "Electronic-Extrusion" process.

Other Microlite advantages are its light weight; its low space requirement; the fact that it does not support fungus growth or bacteria; that its inorganic glass fibers are non-combustible; that it resists settling, is fire-resistant and moisture-resistant; its resilience, which permits compression packaging—saves shipping and storage space.

FREE: Send for literature giving full information about Microlite.
Write L-O-F Glass Fibers Company, Dept. 39-26, 1810 Madison Avenue, Toledo 1, Ohio.

L·O·F GLASS FIBERS MICROLITE INSULATION

L·O·F GLASS FIBERS COMPANY

TOLEDO 1, OHIO

Makers of glass fibers by the exclusive "Electronic-Extrusion" process

THE KENNARD Engineered LINE IMPROVES THE JOB

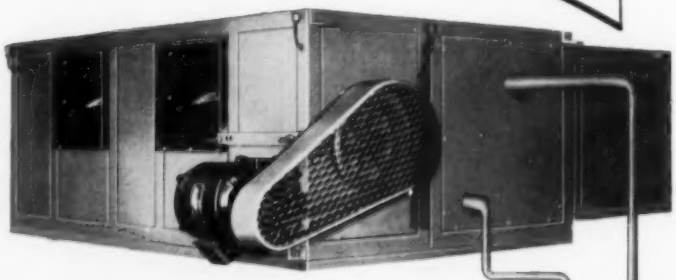
KENNARD COOLING TOWERS

Made in 8 sizes—from 15 to 75 tons. Durably built, completely corrosion proof by galvanizing (after fabrication) wheels, scrolls, sump, blower sections and panels. Stainless Steel or Bronze fastenings.

Practical Research Assures Sound Engineering

Every Kennard product has undergone much testing in our own laboratories. Every phase of use and efficiency has been carefully analyzed and checked.

With the greater need and demand for human comfort and exacting requirements for controlled air conditions on industrial application, Kennard has proven their ability to satisfy and fulfill these uses in many outstanding successful applications of normal or unusual nature.

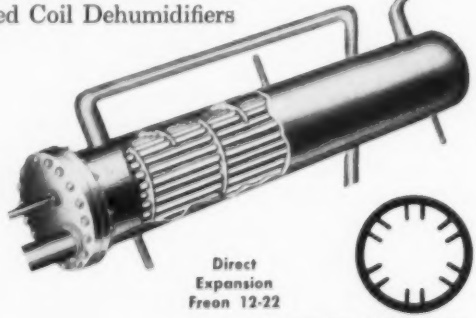


KENNARD AIR CONDITIONING BLOWER UNITS

are adaptable to all forms of air conditioning installations. 14 sizes. 400 to 21,600 C.F.M. Vertical or Horizontal.

Complete the job with other KENNARD products

Coils—Cooling or Heating
Multi-Zone Air Conditioning Units
Evaporative Condensers
Heating and Ventilating Units
Sprayed Coil Dehumidifiers



Cross section of Chiller tube developed by Kennard.

"It's in the fin and the fin is in the tube"—Pat. Applied For.

KENNARD SHELL AND TUBE LIQUID CHILLERS

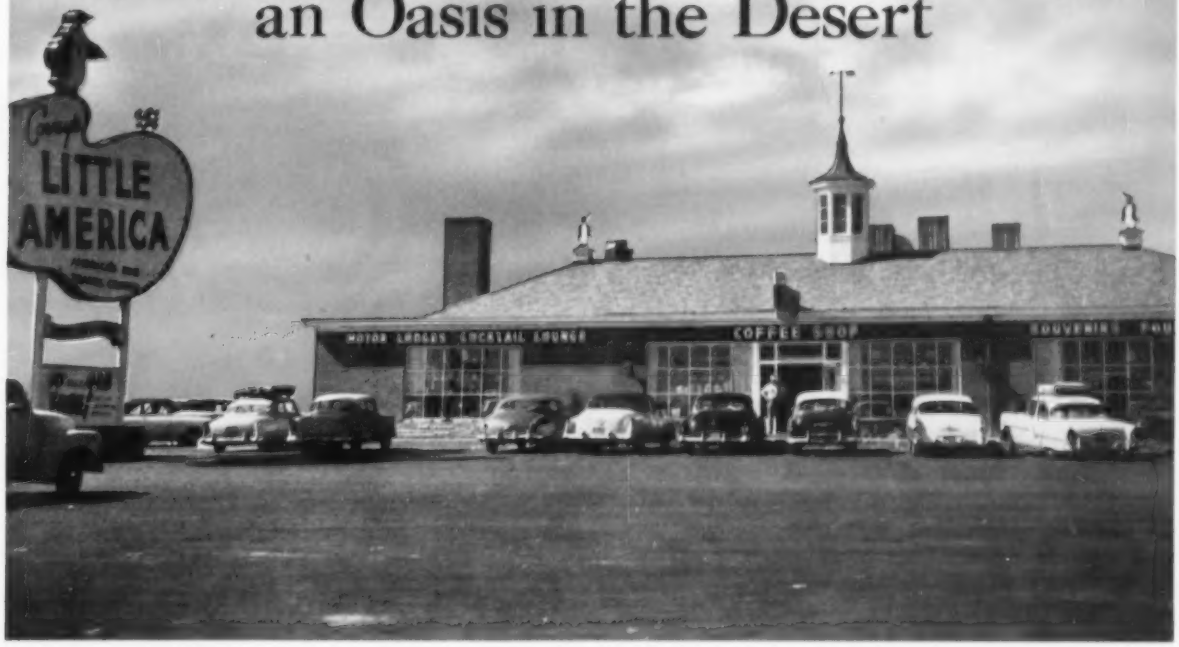
Revolutionary internally finned tubing gives greater capacity and its new design guarantees positive oil return and eliminates the refrigerant head gasket to prevent possible leaks. Sizes from 2 to 200 tons.

KENNARD CORPORATION
1817 HANLEY RD. • ST. LOUIS 17, MO.

CONSULT YOUR KENNARD REPRESENTATIVE
There is one in every principal city

at famous Little America Tourist Court . . .

SPANG CW Steel Pipe Provides an Oasis in the Desert



MAINTAINING a water supply in the desert is a tough job. But Little America Tourist Court in the heart of the Wyoming Desert reports that SPANG CW Steel Pipe has stood up under desert conditions better than any other pipe they have ever used.

Two miles of SPANG CW bring in 30,000 gallons of spring water daily to Little America's underground storage tanks for cooking and drinking uses. SPANG Pipe is also used for natural gas lines and the five-hydrant fire-fighting system on the 640-acre site.

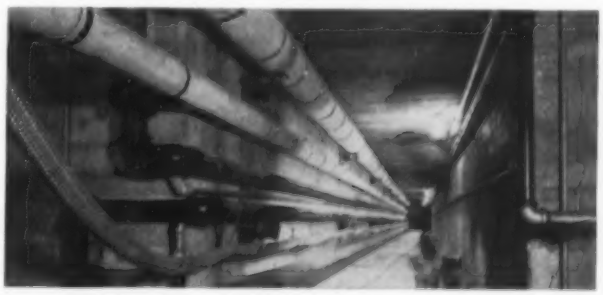
Fred Mauch, Little America's chief maintenance man, says: "That SPANG water line is really holding up. SPANG Pipe has lasted better than any we have tried."

Earl Holding, manager of Little America, adds: "Our SPANG-piped fire system paid for itself. Savings on the first three-year premium paid for the entire cost of the pipe, pumps and hydrants. And the SPANG Pipe from the spring supply to the main installation has been trouble-free in five years of operation!"

This is *quality-controlled* SPANG CW Steel Pipe in action . . . typical of the service you get from SPANG in any type installation. Try it and see! Write for the name of your nearest SPANG Distributor.

Located in the middle of the Wyoming desert on US 30, Covey's Little America is a haven for travelers and truckers. It grew from a boy's dream to a self-sufficient tourist city of 30 buildings, including lodges, gift shops, service station, dining room, soda fountain and cocktail lounge.

General Contractor: Cannon Construction Co., Salt Lake City
Plumbing Contractor: Smithfield Plumbing Co., Salt Lake City
SPANG Distributor: National Supply Store, Rock Springs, Wyoming



SPANG Pipe supplies water, natural gas and fire protection at Little America, the world's largest one-stop travel center. All piping systems reach their main control areas through this underground tunnel.

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

Announcing

THE PUBLICATION OF

"Heat Flow by Radiation in Buildings

SIMPLIFIED PHYSICS"

by Alexander Schwartz

Member, American Society Heating & Air-Conditioning Engineers
President, Infra Insulation, Inc.

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A discussion of the newest theories and practises, with simple experiments and explanations of the fundamental laws of physics involved, in the field of heat flow, vapor flow, and condensation.

Here is a manual invaluable to the architect, engineer, builder, contractor, dealer, and also the professor of technical subjects and students. Of scientific exactitude, yet so simply written and clearly presented, even the layman can read and profit from it. Its scope is broad, ranging from the laws of Nature which underlie the subject, to illustrated techniques for installing insulation under many normal and unusual conditions, both normal and unusual.

In this one, handy 48-page brochure, are assembled in condensed, easy-to-read language, facts, figures, scientific theories, and reports of experiments obtainable otherwise only through years of intensive study and the consultation of hundreds of books, articles, reprints and other publications. It contains current material which is the fruit of the author's vast experience and contact with scientists, engineers, architects, builders, mechanics, home-owners, directors of research, and government officials. It is liberally illustrated with drawings, photographs, charts, diagrams, and tables.

ABOUT THE AUTHOR

Mr. Schwartz, a well-known figure on the lecture platform before professional societies and in technological institutes, has a rare gift for presenting his material in an interesting way that makes it easily grasped —and remembered. He is the author of "Simplified Physics of Vapor and Thermal Insulation," hundreds of thousands of copies of which have been used throughout the years by the building industry, and as a text by scores of universities, colleges, schools of architecture and engineering.

For a free copy of "Heat Flow by Radiation in Buildings," send the coupon.

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Please send "Heat Flow by Radiation."

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Air Conditioning Sales To Rise 15 to 20 Percent

. . . in 1956, says industry leader

AIR CONDITIONING sales should rise as much as 15 to 20 percent in 1956, according to D.C. Minard, president, Trane Co.

Several factors will give extra stimulus to air conditioning equipment sales this year, he says. More new buildings are being air conditioned, the rate of air conditioning existing buildings is rapidly accelerating, and air conditioning in industrial plants for both industrial process and worker comfort is expanding to a major market.

Also, sharp rises in all fields of construction except residential are seen. ≠

February Is Month of Several Industry Weeks

. . . engineering, advertising, electrical

NATIONAL ENGINEERS Week will be observed February 19 to 25 for the ninth year. The week coincides with the birthday of Washington, who is considered the U.S.'s first engineer of lasting stature.

Also to be celebrated February 19 to 25 is National Advertising Week, sponsored by the Advertising Federation of America. The theme: "Advertising Benefits You."

Advertising's service to everyone and its importance to the nation's economy is reflected in increasing public understanding and recognition of advertising.

The advertising pages of HPAC and 1869 other U.S. business and professional publications bring news, ideas, and detailed information on modern methods of business and technology to specialized fields.

To serve readers and buyers, advertisers invested $430 million in business publication advertising in 1955 for space and production costs. Business publications receive 5 percent of the $8 billion total investment in advertising in the U.S. but 41 percent of the $950 million industrial advertising expenditure. Total businesspaper circulation is 32.7 million.

National Electric Week, to be celebrated annually the second week in February, will be observed for the first time this year.

The purpose is to "focus attention on the contributions of electricity to our American way of life and on contributions made toward the economic strength of our country by the organizations making up the electrical industry."

The week will also emphasize the importance of safety through adequacy of wiring installations. ≠

Prudential Building Spurs Modernization

. . . of other office space

A NEW TONE for office space is being established in Chicago by the 41 story Mid-America home office building of the Prudential Insurance Co. of America, according to C. F. Murphy, Jr., of Naess and Murphy, architects for the Prudential building.

Renting with success at rates about $2 more per sq ft than for older non-air conditioned buildings, the Prudential building is proving that there is a market for modern facilities, he said at a recent meeting of the Chicago Junior Association of Commerce and Industry.

The giant new structure has not only encouraged new office building construction but also set off a train of modernization of older facilities, he said. ≠

Construction Contracts, 1955, Hit All Time High

. . . for 10th straight year

CONTRACT AWARDS in 1955 for future construction in the 37 states east of the Rockies set new records, according to the F. W. Dodge Corp.

The year's total of $23,745,277,000 was an all time high, 20 percent higher than the 1954 total, which itself broke all previous records.

Last year was the 10th successive year of new record volumes. It set new records in all three classifications: nonresidential, $8,496,829,000, up 19 percent over 1954; residential, $10,185,259,000, up 20 percent; heavy engineering, $5,063,189,000, up 22 percent. ≠

"Quote"

"Automation means air conditioning. They are twins in one sense. It is possible to have conditioning of industrial plants without automation. But it is not possible to have automation without air conditioning."—*Cloud Wampler, president and chairman of the board, Carrier Corp., at a recent meeting in Syracuse, N. Y.*

FRANK P. KEENEY
Publisher of HPAC

FRANK P. KEENEY, chairman of the board of Keeney Publishing Co., the publisher of Heating, Piping & Air Conditioning, died January 9 at the age of 78 in his apartment at South Shore Country Club, Chicago. Funeral services were held at Tecumseh, Mich., where he was born on November 4, 1877.

Mr. Keeney's business life was spent in business paper publishing, starting in 1899. Although not always in good health in recent months, he maintained his interest and activity in his work until the day of his death.

Mr. Keeney had been president of Engineering Publications, Chicago, for some years when, in 1933, the Keeney Publishing Co. was founded. All of the stockholders and all of the officers of the Keeney Publishing Co. were associated with Mr. Keeney at the time the company was founded and have been so continuously since 1933. The loss of his wise counsel will be felt particularly by them and his other business associates over the coming years. The company that bears his name will continue his ideals under the direction and ownership of this group.

Mr. Keeney was well-known and well-liked in business paper publishing circles, in which he was a leader. Among his many publishing activities, he had served as a director of the Audit Bureau of Circulations from 1941 to 1945.

He was equally known and liked in the fields served by the Keeney Publishing Co.'s magazines. A life member of the American Society of Heating and Air-Conditioning Engineers, there were — until recent years — few national ASHAE meetings that he missed. He was an active member, too, of the Society's Illinois chapter.

In the years prior to World War II, Mr. and Mrs. Keeney travelled widely, visiting Europe, South America, Japan, Egypt and many parts of North America. They spent a good part of recent winters in Florida, and were looking forward to doing so again this year.

Mr. Keeney was a member of South Shore Country Club, Chicago, where he had maintained his home for many years; he was also a member of the Chicago Athletic Association.

Although his career was a long one and a successful one, the deep sense of loss and sorrow felt by his friends and his associates is not lessened thereby.

(1877 — 1956)

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installing nesbitt sill-line...

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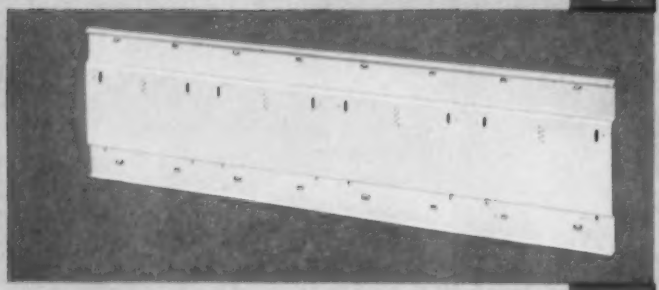
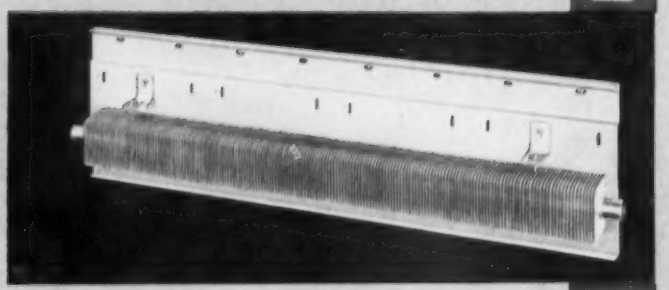
1



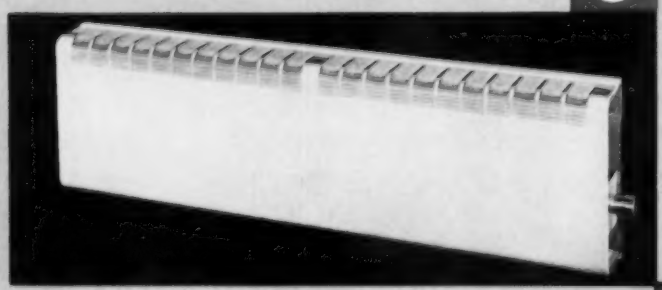
Erect the back panel. It is one true and rigid piece, formed of 20-gauge steel. It fastens to the wall or studding with a few screws and alines perfectly when butted to other sections. With seven lengths — 2 to 8 ft. — and sleeves, you may fit any wall to wall without cutting.

2



Suspend the heating element. There are eight types, with corrugated aluminum fins, offering a wide range of capacities, steam or hot water. The copper tube ends are sized-to-mate for easy sweat jointing, and the adjustable hanger brackets provide for pitch and expansion.

3



Mount the front enclosure. The die-formed 16-gauge front locks into back panel for full length support at top and bottom. Other accessories are added. One, two, three — and the world's most beautiful perimeter radiation is ready to bring comfort with economy to modern interiors.

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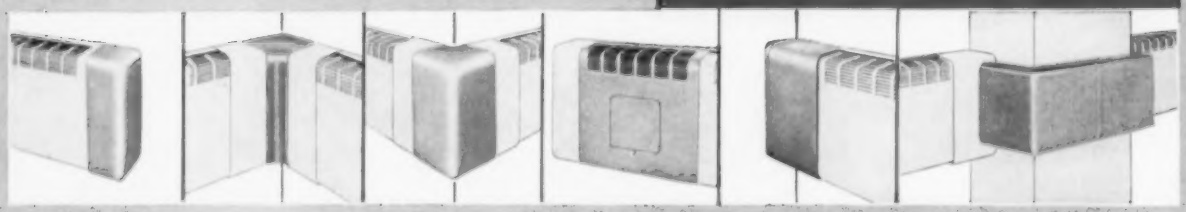

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• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Air Conditioned Apartments Require Flexible Control, Noise Reduction

HERE ARE a few comments on the article by Nathan Feder, *Remote Unit Central System Heats, Cools Luxury Apartments*, in the January HPAC.

The basic design as described is sound in principle and provides the necessary flexibility for individual tenants. The four-speed fan control may be an elaboration, but, if economical, is justified. Apartments are very much like hotels in the need for extreme flexibility.

The manual changeover and resetting of water temperatures is also desirable, but is subject to the use of an intelligent operating engineer. Control of temperature is the heart of all systems of cooling or heating, and apartments appear to be a mean between complete automatic individual control as practiced in modern office buildings and the simpler conventional systems controlling broad zones.

The use of the selected insulation and isolation materials for piping and equipment is most desirable and necessary for this type of building. Though no details were shown, it is presumed that this was designed to the limit of insurance against noise and vibration. A useful design procedure is to keep water velocities low at the cost of a single increase in pipe size. Covering alone does not always absorb water noise in piping.

The use of 146 fan driven coolers with filters may become a maintenance problem in the future if not systematically cared for. We believe a schedule of work should be prepared for periodic inspection and maintenance of these units. This does not imply a criticism of the use of fan driven units.

FRED G. HAMBURGER
Guy B. Panero
Consulting Engineers

Equitable Bidding Practices Serve Best Interests of Purchasers, Industry

CONSIDERABLE INTEREST has been shown recently in acceptable bidding practices for mechanical (heating, piping, and air conditioning) contractors. A fair and equitable bidding procedure now in use in the Chicago area which has contributed greatly to the best economic interests of purchasers and, consequently, beneficial to the industry as a whole, is as follows:

1) A definite closing date. Time should be established by the awarding authority for receiving all bids, and no bids shall be tendered or received after said closing time.

2) When the awarding authority issues requests for mechanical bids which stipulate that all said bids shall be submitted direct to or through the owner, architect or engineer, this stipulated bidding procedure shall be strictly adhered to, and no mechanical bids shall be processed through a general contractor.

3) When the awarding authority issues requests for bids which stipulate that mechanical bids be submitted through the general contractors, the requests for said bids shall stipulate that the names of proposed mechanical subcontractors be stated in, and officially be considered as part of, the bid submitted by the general contractor.

Regarding open versus closed specifications, if the engineer leaves the choice of equipment to the contractors, open specifications only serve the shopping contractor.

I firmly believe that the base bid with alternates is the fairest and most practical.

This specification names a definite make of material or equipment but provides that if the bidding contractors desire to submit a proposal on substitute products or equipment, they may do so.

They must, however, file their bids based upon the plans and specifications and are required to state in the bid the deduction or addition to be made to the owner in case the substitutes are accepted.

NORMAN E. BUETER
Consulting Engineer

Most Heating Boilers Selected On the Basis of Their Net Ratings

IN HIS COMMENTS in the January HPAC on my comments which appeared in the October 1955 HPAC, Herbert C. Johnson, Chief Smoke Regulation Engineer of the City of Columbus, Ohio, states that he sees no reason why SBI Table 1 boilers should be rated at fewer Btu per sq ft of heating surface than Table 2 boilers.

The main reason SBI has not seen fit to do this is because in the case of Table 2 boilers the ratings must be substantiated by test in accordance with the SBI Testing and Rating Code. Table 1 boilers are

rated on an empirical method based only on physical dimensions. It is felt, therefore, that a lower rating per sq ft of heating surface should be used for Table 1 boilers to allow for the fact that ratings are not substantiated by test.

The suggestion is frequently made, why not test all boilers and rate them on the basis of the higher transmission rate? This is a logical question, but it must be realized that the testing of larger boilers is very costly. To test a manufacturer's complete line of large steel boilers for rating purposes would probably cost $100,000 or more, and if the manufacturer made several types of large boilers, it would certainly be more costly. This would be unfair to the smaller manufacturers of steel boilers, in my opinion.

SBI has been gradually raising the upper limit of sizes for which boilers are rated as Table 2 boilers. A number of years ago, only the small residential boilers had to be tested. Later, the range was extended to include boilers up to 3000 sq ft of steam SBI Net Rating and, more recently, to include boilers up to 5000 sq ft of steam SBI Net Rating. This range may be extended further at a later date.

It would be ideal if all boilers could be rated on identically the same basis instead of using the several codes that exist for different types of boilers. However, the fact remains that they are not rated identically, and it would be very helpful if those who select boilers would recognize the codes by which different boilers are rated, where those codes have been adopted as national standards by the industry.

The subject of boiler ratings is a complex one and seems to be a confusing one. We must keep in mind the fact that these different codes have been developed at different times by different groups and apply to different types of boilers. There are some commercial, economic, and technical factors that have been considered in rating some of these boilers which are partly responsible for these code differences.

An example of one of the technical reasons may be seen in the case of gas fired boilers. With gas fired boilers, the amount of CO in the flue gas is an excellent indication as to when the boiler rating has reached its top limit, as far as the combustion of the gas is concerned. We find that the CO limitation is an important one in the case of American Gas Association Approval Requirements for gas designed boilers. The CO is meaningless in the case of oil fired boilers because there is little or no relationship between the completeness of combustion when burning oil and the amount of CO in the flue gas. Incompleteness of combustion is likely to show up as unburned hydrocarbons, which are difficult to measure.

Mr. Johnson states that the nozzle output rating would be the most logical rating for boilers, and we agree that each code should give a means of determining a nozzle output rating or gross output.

In the case of the present codes that have a means of determining nozzle output or gross output, the gross output is selected on a basis where the boiler can be operated continuously at a rate that will give good, safe, economical operation, with a reasonable stack temperature and high efficiency. There should be no fear of operating the boilers indefinitely at these gross outputs.

If all boilers were selected by engineers who had a thorough understanding of the piping and pickup allowances that should be used on the different installations, this would probably be the only rating that need be shown for boilers. The reason for this is that after the heat loss from the building or the net load had been determined, it would be necessary only to add the piping and pickup allowance and select a boiler with a gross output equal to or greater than the sum of the net load and the piping and pickup. However, a great many boilers are selected by persons who do not have a thorough understanding of piping and pickup and, therefore, the heating boiler industry has adopted Net Ratings for boilers. The person making the selection can select a boiler with a Net Rating equal to or greater than the calculated net load with the assurance that the boiler will carry the job if the piping and pickup for the job is at all normal. By far the greatest majority of boilers are selected on the basis of their Net Ratings.

It is difficult to establish a relationship between the rate at which a boiler is fired and the life of the boiler. If a boiler is properly designed and properly cared for, it can be fired at a very high rate without affecting adversely the life of the metal itself. It is true that it may not be advisable to fire the boiler at this high rate because of the adverse effect on efficiency and economy of operation, but nevertheless no damage should result due to the high rate of firing of itself. If the boiler is not properly designed and it is not properly cared for, the higher rate of firing, of course, may cause the boiler to fail sooner than would otherwise be the case.

The firing rates that are used on heating boilers today, although they may seem to vary considerably between one type of boiler and another, are very much lower than firing rates used on power installations.

Mr. Johnson states: "It is evident that Table No. 1 SBI boiler ratings will carry nearly 200 percent of the SBI ratings." It is not clear to me how Mr. Johnson arrived at this conclusion from my previous comments. It is our recommendation that steel boilers be selected on the basis of their SBI Ratings or SBI Net Ratings. Also, since the SBI Code does not give an output corresponding to the gross output or nozzle output where such an output is desirable, we recommend that it be determined on the basis of 150 percent of the SBI Net Rating (not the SBI Rating).

The SBI Net Rating may be used as the basis of selection when the net load only has been calculated and the piping and pickup requirements are assumed to be normal. The SBI Rating may be used where the net load and the piping load have both been deter-

mined and the pickup load is assumed to be normal. The gross output may be used where the net load, the piping load, and the pickup load have all been determined.

Mr. Johnson refers in the last paragraph of his comments to a possible typographical error in my previous comments. This was not a typographical error. Large steel boilers are being cataloged and sold and have been successfully used for some time with base heights of the order of 4 in. to 8 in. rather than with the more conventional high base heights of 15 in. The fronts of the boiler shells are altered to provide for installation of the burners.

L. N. Hunter
Senior Vice-President for
Engineering and Research
National-U. S. Radiator Corp.

Continuous Slot Air Delivery Seems Least Logical Way To Solve Downdraft

Having had some experience in testing various methods of combatting window downdrafts in schoolrooms, I disagree with one statement in the article, *Continuous Slot Air Delivery Under Large Windows Prevents Drafts in New School Under Construction*, by K. L. Beseke and L. J. Schutte in the November 1955 HPAC. The statement is that the introduction of air at the bottom of large windows through a long, narrow slot "seemed to be the most logical answer" to the downdraft problem. While the system as described will probably work quite well, it seems to me that the data presented on its performance goes a long way towards demonstrating that this general approach is the least logical way to tackle the problem.

For years, engineers have attempted to combat downdrafts by installing finned tubing beneath windows to create a sluggishly moving, rising column of air to intercept the downward movement of chilled air off the glass. This, too, has seemed logical. And yet, in the discussion of this new system, the preliminary studies showed that it was necessary to employ an air stream with a velocity of 750 fpm and to deflect it toward the window to "prevent cold downdrafts from breaking through." This checks with my experience and shows very vividly how incapable a convection current is of accomplishing the purpose.

As for the high velocity method used, my experience is that this is an excellent method for increasing heat losses during heating periods. If it has not occurred to the authors of the article that blowing a stream of 110 F air against cold window glass is a good way to try to heat the outdoors, I suggest they check the heat loss factors in the ASHAE Guide. Since in their method all of the heating air entering the room is first blown against the window, it would not surprise me if heat losses were just about doubled during warmup periods.

There is, of course, another way to deal with the downdraft problem. This is to draw off the air chilled by the glass as it reaches the window sill. Once this has been done, it can either be mechanically mixed with warm room air, heated, or expelled from the room, depending upon the thermal requirements. This method is positive, simple, and effective. It has the advantage of working equally well whether or not heating is required. It does not increase heat loss. I submit that if any method for controlling downdrafts deserves to be described as "most logical," it is this one.

Henry Wright, Technical Consultant
Herman Nelson Unit Ventilator Div.,
American Air Filter Co., Inc.

The Author's Reply—In reply to Mr. Wright's comments and to those of E. Arenz, in the January HPAC, on the article by myself and L. J. Schutte, *Continuous Slot Air Delivery Prevents Drafts in New School*, in the November 1955 HPAC, there are several things I would like to point out.

There are, of course, many methods of providing a good heating and ventilating system for any building. For this particular building, the method selected was the best, in my judgment. My judgment was not influenced by the desire to sell or produce equipment at a low cost. The following will clarify some of the points referred to in Mr. Wright's and Mr. Arenz's comments.

Tests showed that, under all conditions of outside temperature and supply air temperature, the air distribution was not affected and no downdrafts occurred. The so-called "complicated baffling system" will decrease any balancing required, rather than increase it. Due to certain circumstances, this arrangement was used, but it is my own belief that a much simpler arrangement would work satisfactorily. It might be noted that the velocity along the slot diffuser did not vary as much as 5 percent for any given cfm. Also, filter servicing with this type of system will be much simpler than with unit ventilators because there are only two locations where filters must be serviced and because of the type of filters used.

The air quantities in the classrooms can be reduced by 20 percent in this school before the velocity will fall below 750 fpm. If the filters are not kept clean in any system utilizing a slot for returning the air, much more difficulty will be experienced than in one using a slot for air supply, because the downdraft will drop onto the students. When air is being supplied, a reduction in velocity below 750 fpm will affect the air distribution slightly but a lower velocity will effectively combat the downdraft. Even with the effect of a lower velocity, the air distribution is superior to most other types of air distribution.

It is true that the heat loss will be increased, particularly during warmup time, but the time of warmup for a system returning air through the continuous diffuser will be increased four or five times because the

air temperature at the floor near the outside wall could not be brought up to room temperature for several hours. With the warm surface of the metal cabinets, the warmed glass temperature, and the warm air stream, the occupants can be comfortable at a lower room temperature when air is supplied through the grille rather than being returned.

Because there are only a few returns for the entire system, the cost of ductwork would be greatly increased if the grilles were used for returning air, since a complete return system connecting to each room would be necessary. It is unreasonable to spend this extra money for a system that is inferior to the one designed.

KENNETH L. BESEKE
Holland and Beseke,
Consulting Engineers

NFPA Records Show 96 Percent Efficiency for Automatic Sprinklers

THE ARTICLE, *Automatic Sprinkler System Protects Printing Plant*, in the November HPAC should be a help in the cause of fire safety.

However it seems to me that the references to fire experience could have been more complete. I would like to point out that records of the National Fire Protection Association, dating from 1896 and covering approximately 100,000 fires, show a general automatic sprinkler efficiency of over 96 percent.

The NFPA records for the period 1925-54 contain reports of 1388 fires in printing plants equipped with automatic sprinklers. In all of these cases, the sprinklers controlled all but 17 of the fires. This represents only 1.2 percent of the total. In the majority of these 17 cases of unsatisfactory operation, the cause was that someone had shut off the water supply to the sprinkler system.

It might also be of some interest to mention the fact that automatic sprinkler protection is customarily installed in accordance with well established standards developed by the NFPA with the cooperation of the sprinkler manufacturing industry, insurance interests, property owners, and others.

The 1955 edition of the NFPA Sprinkler Standards contains complete information on recognized installation practices, including the use of new spray sprinklers, which have been shown by test to have a substantially greater extinguishing efficiency than previous types.

ROBERT S. MOULTON
Technical Secretary
National Fire Protection Association

Article on Snow Melting Design and Installation Informative

I HAVE READ with interest the informative article, *How To Design and Install Snow Melting Systems*, by F. F. Stevenson, in the January HPAC.

I agree that ferrous pipe should not be embedded in concrete containing calcium chloride. It should be completely embedded in the concrete. Wood, bricks, or soft stones should not be used as supports when the coils are leveled. Concrete mounds or steel supports are recommended. The slab should be over a well-drained fill of crushed stone or washed gravel.

As Mr. Stevenson says, better heat transfer is obtained when the pipe coils are completely embedded in the concrete.

Also, it is generally accepted that heat transfer depends upon the concrete in which the pipe is embedded. Therefore, the heat transfer to the slab should be practically the same for all materials when the coils are embedded. It is also recognized that heat emissivity from copper tube to air is considerably less than from black ferrous pipe, and in the case of coils laid on crushed stone the conductance of copper is not the important factor. In this connection, *Laboratory Studies on Heat Flow Within a Concrete Panel*, as reported in the Journal Section of the April 1950 HPAC states: "The pipe material—ferrous or nonferrous—was ruled out as an important thermal variable for the concrete slabs involved. Calculations showed that the thermal resistance of the pipe, regardless of the metal used, was entirely negligible in relation to the other thermal resistances involved."

It is also true, as Mr. Stevenson points out, that heat input should include other factors than that necessary to melt the snow. Included should be heat losses from the back and edge of the slab, raising the temperature of the snow at falling to melting temperature, heat necessary to evaporate some of the water formed through melting, and convection and radiation losses. The use of the slab warmup method is different and considered good for determining the heat input. The heat inputs mentioned in the article are believed to be in line with requirements.

However, since the pipe surface required would be similar for any material, I question the procedure for calculating pipe surface given on page 173 of Mr. Stevenson's article.

GEORGE D. LAIN
Research Engineer
Committee on Steel Pipe Research
American Iron & Steel Institute

Radiant Heating Coils for T.C.A. Hangar Are Black Steel, Not Galvanized Steel

WITH REFERENCE to the article, *Two New Air Terminals Heated By Radiant Panels*, in the October 1955 HPAC, the radiant heating coils for the Trans-Canada Air Lines hangar were referred to as being constructed of galvanized steel pipe. This was in error, the piping installed being black steel piping.

R. B. CAMPBELL
Professional Engineer
A. D. Margison & Associates, Ltd.

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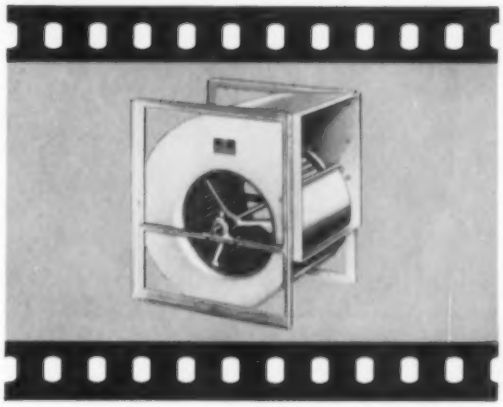

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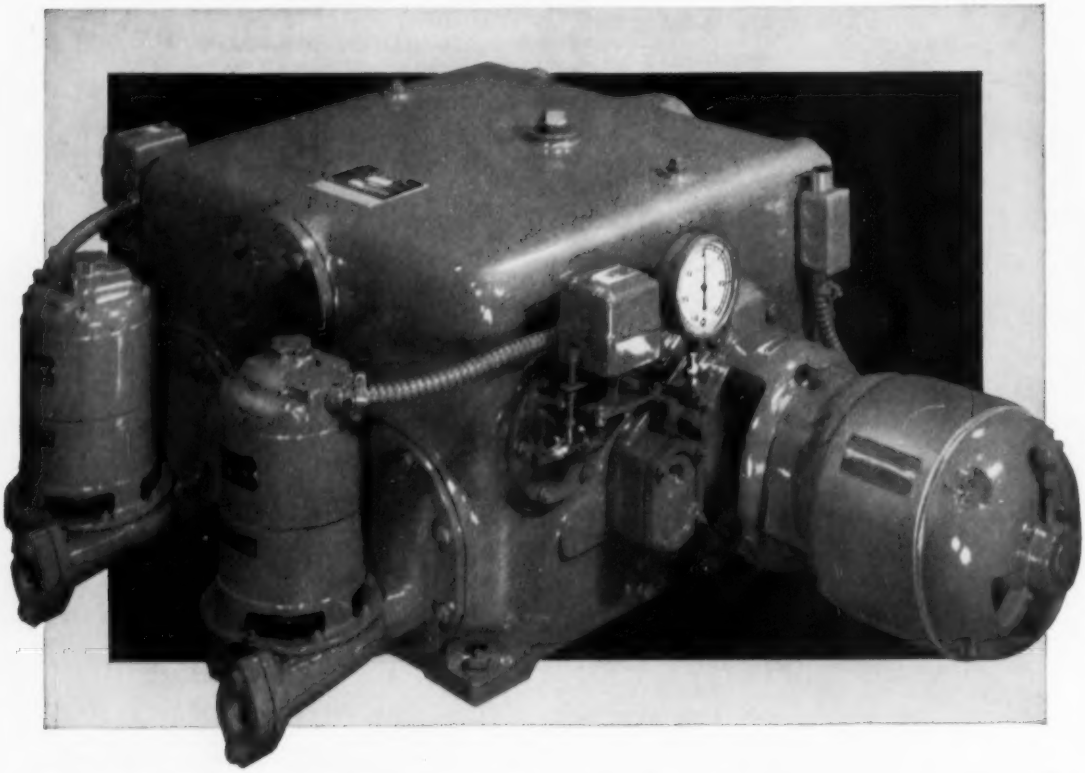

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These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

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- Flexibility permitting addition of radiation without changing basic pump installation.
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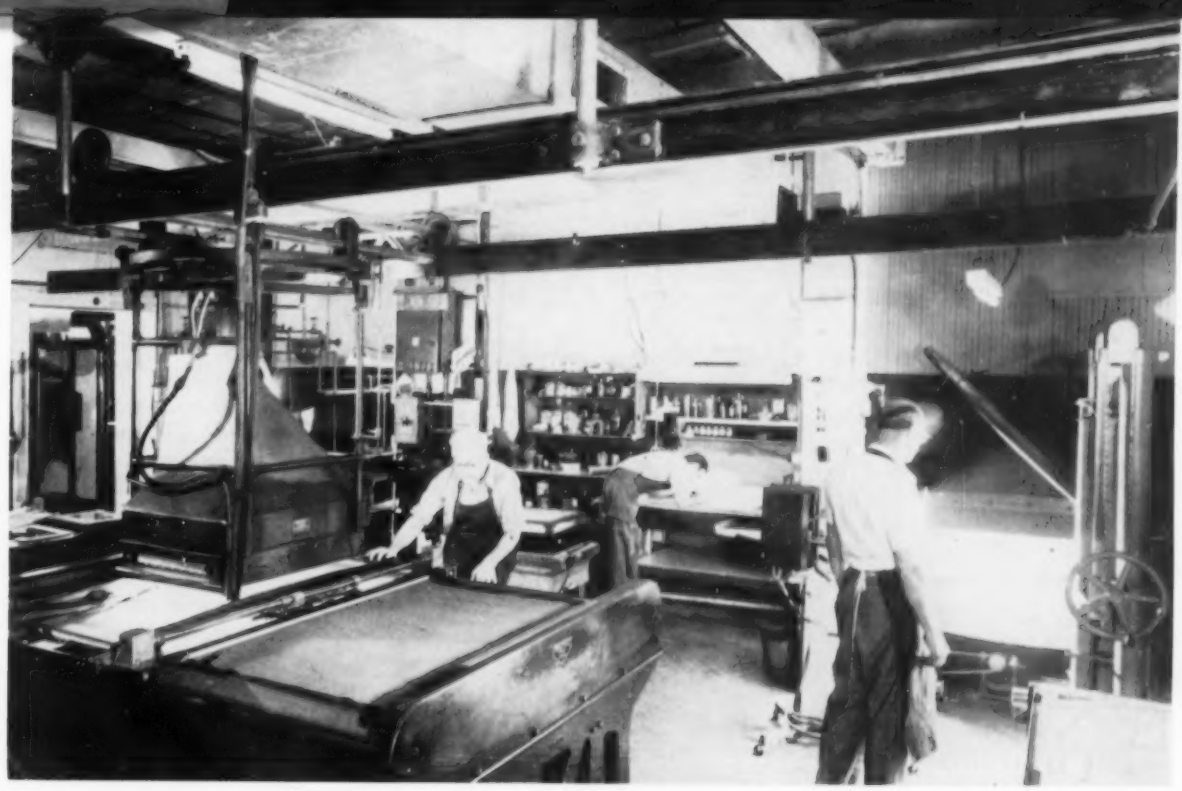


CONSTANT CONDITIONS in the photo and plate rooms are provided by a year 'round air conditioning system, including ventilation, heating, cooling, filtering, dehumidification, and humidification

Air Conditioning Solves Printing Problems

. . . by eliminating temperature and humidity variations and static electricity. Year 'round controlled environment for paper storage, lithographic platemaking, and press work has increased production and improved product quality in this decal printing plant.

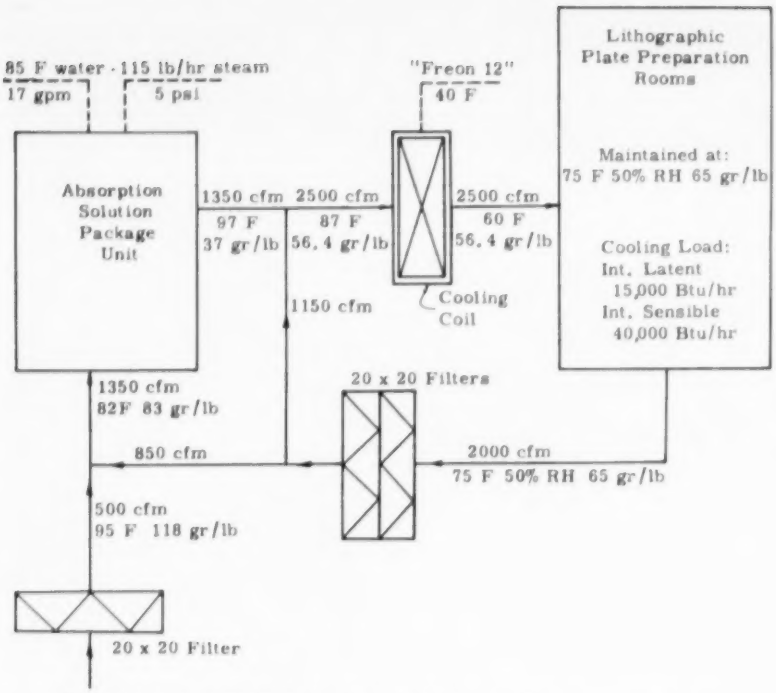
By William H. Junker
Mechanical Engineer
Frankenberger, Junker & Lensky
Engineers and Architects

MOISTURE SENSITIVITY of materials and equipment used in printing necessitates rigid humidity control in all stages of production. The installation of humidity conditioning at the Palm Bros. Decalcomania Co. plant, Cincinnati, has simplified and standardized procedures, increased production, and assured product quality.

Moisture Affects Paper, Ink

Paper shrinks or swells as its moisture content varies. If not properly stored it curls, waves or buckles. Exposed to excessively low humidity, it accumulates static electricity. Often, loss of production, lowered quality, or even complete shutdown results.

In lithography, particular care must be taken in the seasoning of paper in storage if flatness and register in printing are to be maintained. Because the paper will absorb some of the water used in the lithographic process, it is the practice in some



FOR SUMMER COOLING, 500 cfm of filtered outdoor air from the factory, at maximum design conditions of 95 F, 118 gr per lb, or 45 percent relative humidity, are mixed with 850 cfm of recirculated air. The total of 1350 cfm, at 82 F, 83 gr per lb, is passed into the air washer, contacting the absorbent solution, then passed over the cooling coils

plants to forestall consequent dimensional changes and misregister of impressions by increasing the paper moisture content while in storage. The relative humidity in the storage rooms is kept 5 to 8 percent higher than that of the pressroom. Thus, when brought out for printing, the paper loses the amount of moisture it will gain during the printing operation.

Paper for other processes can be stored at the same relative humidity as that maintained in the pressroom. About 76 F and 50 percent relative humidity is considered optimum for all lithographic needs.

Inks are also sensitive to variations in relative humidity. The rate of flow, distribution on rollers and the rate of drying differ at varying humidities. High humidities cause slow drying, disruption of schedules and increased operating costs. Low humidities and attendant static electricity can prevent the trapping of air between sheets of paper, thus slowing the rate of drying. With a constant humidity and temperature, these processes can be standardized and the proper addition of driers determined.

TABLE 1—HEATING AND COOLING LOADS of the air conditioned space were established from the following conditions and calculations as the basis for the system

	Maximum Conditions Outside			Conditions Maintained Inside			Sensible Load, Btu per hr		Latent Load, Btu per hr	
	Temperature, F	Gr per lb	Relative humidity, percent	Temperature, F	Gr per lb	Relative humidity, percent	Internal	External	Internal	External
Summer[1] cooling	95	118	45.8	75	65	50	40,000	41,300	15,000	18,000
Winter[2] heating	0.	5.5	100	75	65	50	10,000	58,000		18,000

[1]Sensible extraction by refrigeration: 81,300 Btu per hr. Latent extraction by absorption: 33 lb of water per hr.
[2]Sensible introduction by heating: 48 lb of steam per hr. Latent introduction by evaporation: 18 lb of water per hr.

Humidity Affects Platemaking

The elimination of variables, directly related to temperature and humidity, is air conditioning's primary benefit to lithographic platemaking. At certain humidities it is extremely difficult, if not impossible, to "shoot" quality plates. Receptivity or sensitivity to light varies and uniformity suffers. Plate coatings tend to soften to such an extent that negatives or positives stick to the plate. The acetate film itself will expand or contract under varied humidities.

Thus, humidity control is necessary in all steps of lithographic platemaking, even to developing and finishing, if loss of press time, increased overtime, and expensive schedule upsets are to be avoided and steady, high quality production maintained.

Pressroom Humidity Problems

Variations in pressroom humidity can also lead to serious difficulties. A fluctuation of only 5 percent causes distortion of as much as 0.03 in. on a 60 in. sheet of paper. But the biggest air conditioning problem in printing is the elimination of static electricity. Its accumulation in paper interferes with the operation of automatic pile feeders, causing slowdowns and costly stoppages. When humidity and temperature are too high, the rubber rollers soften; when too low, they dry out and inks do not distribute properly.

The heat generated by the mechanical and electrical equipment must be carried off by an air conditioning system if overheating is to be avoided.

The Making of "Decals"

Production problems are multiplied at Palm Bros. by the very nature of the product itself — "Decals". By definition, a decal is a picture or a

design of many layers made of a heavy film of colored pigments on a temporary paper backing. In application, the design — large or small, one color or many — is transferred from the paper to another object, becoming a permanent part of it.

Although the film design may be built upon the paper backing by several methods, lithography is almost invariably used. Special inks, sometimes ground by the printers themselves to get desired qualities, and special papers, coated with a water soluble starch, albumin and glycerine, are required. Ordinarily, decals are printed face down on the coating, one layer or color at a time.

Air Conditioning the Plant

In the new air conditioning system, the overall plan was to maintain constant conditions in the photo and plate rooms by means of an automatic mechanical air conditioning system. This was accomplished by combining ventilation, heating, cooling, filtering, dehumidification, and humidification into the one system.

During the heating season, the space is heated by means of steam coils and humidified by a spray humidifier in the air stream. During the cooling season the space is cooled by means of refrigerant coils and dehumidified by an absorption type unit.

In the summer cooling cycle of operation, 500 cfm of filtered outdoor air from the factory, at maximum design conditions of 95 F, 118 gr per lb — 45.8 percent relative humidity — is brought into the system. This air is mixed with 850 cfm of recirculated air and the total of 1350 cfm, at conditions of 82 F, 83 gr per lb is passed into the air washer section of the unit.

Here the air contacts a lithium chloride solution while both pass over the cooling coils. The lower the temperature of the solution, the more moisture it will absorb. Thus the cooling coils, by varying the solution temperature, regulate the amount of moisture to be removed. Under the maximum conditions, 17 gpm of 85 F city water is used.

After completing this dehumidifying pass, the 1350 cfm of air, now at 97 F and 37 gr per lb, is mixed with 1150 cfm of filtered recirculated air at 75 F, 65 gr per lb. The mixture produces 2500 cfm at 87 F and 56.4 gr per lb. This air, after passing through a cooling coil at 40 F, is delivered to the photo and plate rooms at 60 F, 56.4 gr per lb, maintaining conditions within these areas at 75 F, 65 gr per lb — 50 percent relative humidity.

Intermittently, as the absorbent solution becomes diluted, a small quantity is automatically pumped to the regenerator section of the unit. Here it is sprayed over low pressure steam coils which raise the temperature of the solution, forcing it to release the excess moisture to a scavenger air stream. Under maximum conditions, 115 lb of steam per hr at 5 psi is used for this purpose. From this installation 39.8 lb per hr or 120 gal per day of water is thus purged. After regeneration, the solution is returned to the air washer section for further dehumidifying passes.

[Photos courtesy of Surface Combustion Corp.]

Okay Wrought Solder Joint Fittings

. . . as Type H fitting if they conform to ASA Standard B16.22

FROM time to time certain actions of the Sectional Committee B31 are published for the information of interested parties. While these do not constitute formal revision of the Code, they may be utilized in specifications, or otherwise, as representing the considered opinion of the committee.

Pending revision of the Code for Pressure Piping, ASA B31.1-1955, the Sectional Committee has recommended that ASME, as sponsor, publish selected interpretations so that industry may take immediate advantage of corresponding proposed revisions.

The following cases are published herewith as interim actions of Sectional Committee B31 on the Code for Pressure Piping and will not constitute a part of the Code until formal action has been taken by the ASME and by the American Standards Association on a revision of the Code.

Case No. 22

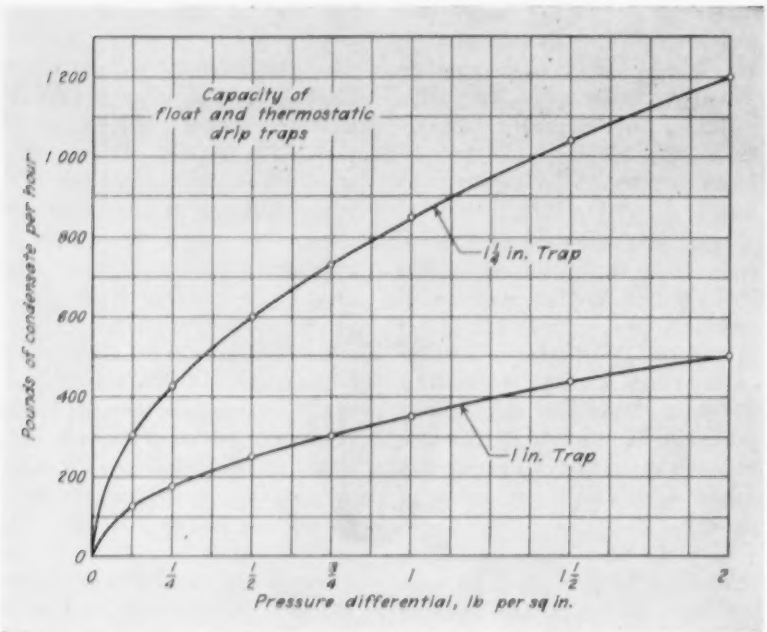
Inquiry: In the ASA B31.1-1955 Code for Pressure Piping, Section 3, Par. 325 (Table 11), the Type H solder joint fittings for Instrument and Control piping and their ratings are limited to those conforming to ASA Standard B16.18. Are wrought solder joint fittings conforming to ASA Standard B16.22 acceptable? Is it permissible to apply the fittings to service other than those indicated in Table 11? May the rating vary with the types of solders used.

Reply: It is the opinion of the Committee that wrought solder joint fittings conforming to ASA Standard B16.22 may be included as Type H fitting in Par. 325 (Table 11) in the subject Code. The services of Type H solder joint fittings shall be limited to those specified in Par. 325 (Table 11), and the ratings shall be limited to those published in the ASA Standard B16.18 for cast fittings and ASA Standard B16.22 for wrought fittings, for the solders specifically named in each standard.

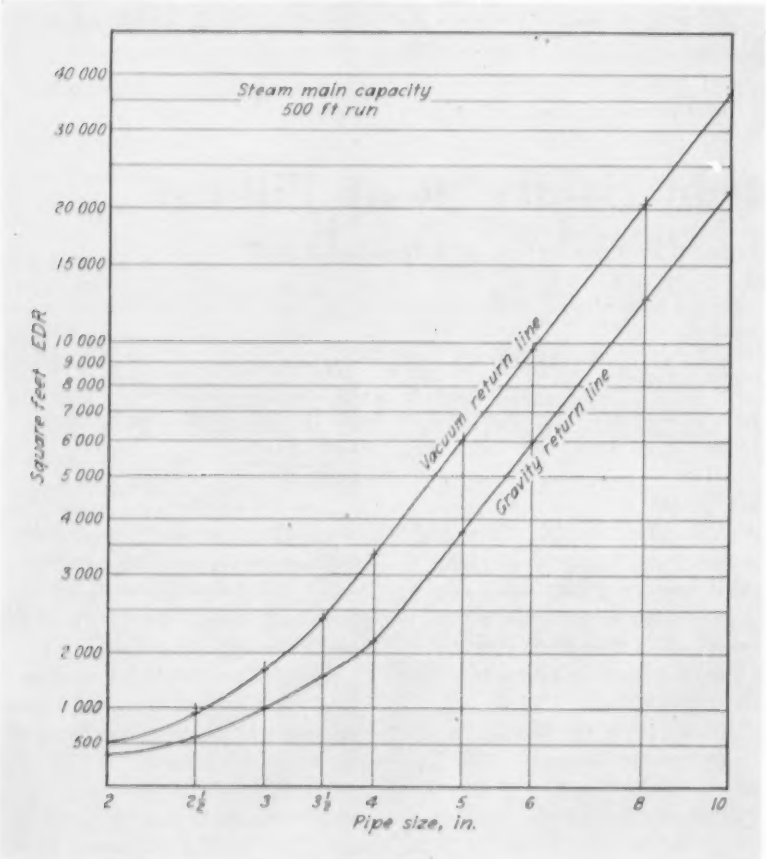
Case 23

Inquiry: Do the provisions of Par. 831.41(h), Section 8 of American Standard Code for Pressure Piping (ASA B31.1.8-1955) apply to reinforcement sleeves, placed over welds or dresser type couplings?

Reply: Par. 831.41(h) applies to local reinforcement of welded branch connections, but not to reinforcement sleeves of circumferential pipe line joints. It should be the responsibility of the installer to determine that failure of neither the reinforcing sleeve, nor the carrier pipe will occur, should fluid become trapped in the annular space between their surfaces.



1 PRESSURE DIFFERENTIAL across 2 psi rated float and thermostatic traps used for dripping and venting steam mains in one large apartment house group was less than ¼ psi, causing water to back up. Below 2 psi, trap capacity decreases rapidly



2 PIPE SIZES should be changed to larger sizes when a vacuum operated steam heating system is converted to one using condensate pumps. With pumps, pressure differential increases, without raising initial pressure and without loss of circulation

Avoid

. . . by being sure that the heating system itself is properly designed, installed, and adjusted to respond to the control. Control devices can't cure defective heating systems. Some faults especially to be avoided or corrected in steam heating systems are: water trapped branch mains, water hammer, inadequately pitched condensate lines, boiler flooding, inadequate pressure differential across drip traps, inadequate zoning of building, and overheating.

By Lewis Smith
Heating Engineer

TOO OFTEN someone gets a black eye or loses a lot of money just because a steam heating control system was improperly applied. Most control devices on the market today are good, but selecting the control is only half the battle. The other half — too often overlooked — is to have the heating system itself properly designed, installed, and adjusted to respond to the control.

There is a psychological aspect to all this which can be very annoying. When a control system is used, everyone expects perfection. Minor troubles which normally occur when starting up any heating system — troubles which are corrected as a matter of course or sometimes accepted as inevitable — are magnified and blamed on the control. This is especially true when an installation is made in an old building. Owners are prone to expect — often prompted by overzealous salesmen — that noisy radiators, bad circulation, and the like will be cured. Yet trapped piping, defective traps, dirt, and similar faults will cause trouble, control or no. A defective heating system was never cured by adding a control device.

A few cases will show the truth of these statements.

These Pitfalls of Heat Control

1 Trap Risers, Mains To Cut Hammer, Up Heat

The original specifications for a low pressure central steam plant heating a group of large apartment houses were quite all right. Pipe and trap sizing was based on the usual tables and practice for a vacuum return line system. Controls of the continuous flow type were specified, one valve for each building, together with a vacuum pump to work in conjunction with the valve. However, one control manufacturer proposed that if his controls were to be used, condensate pumps could be substituted for the vacuum pumps at a substantial saving in first cost. His proposal seemed sound and it was accepted.

When this system was started up, there was severe water hammer in the steam mains every morning when steam was first turned on. The tenants complained that they were being awakened between 5 and 6 a.m. By manually slowing down the rate of opening of the control valves, the hammer was reduced, but circulation was then so slow that a new set of complaints came in from tenants on risers near the ends of the mains. Insufficient heat, they said.

The immediate reaction was to blame the control. This preciptated a four way argument involving manufacturer, contractor, consulting engineer, and owner. The most important matters were trap capacity and pitch of mains.

Pressure Differential Adequate?

Float and thermostatic traps were used for dripping and venting the mains. These traps act like an orifice. The flow of water and air through an orifice depends on the pressure differential across the orifice opening. These traps are rated on the basis of a 2 psi differential and a factor of safety applied to take care of peak loads such as occur when the piping is being heated up from room temperature. As the pressure difference falls below 2 psi, the capacity decreases rapidly, and below ½ psi the drop is especially marked, as shown in Fig. 1.

Now, in the case under discussion, there was very little pressure difference across these traps during the time of heating up the system. The only differential was that created by the flow of air through the traps, which was very small indeed, maybe less than ¼ psi. Therefore, these traps were passing only a fraction of their rated amount of water, and gages attached to the mains showed that water was backing up.

This was accentuated by the fact that the mains were very flat. When this water backed up enough to block a branch connection, water hammer resulted. As soon as the system was hot and steam reached the traps, the thermostatic elements closed and normal pressure differential was created. In other words, just at the time when high capacity was wanted, the ability to pass water was at the lowest point, whereas the rest of the time when the water flow was low, the traps had a good differential and excess capacity.

In this particular case, the risers were not dripped, so that during the morning heat-up period, the main drips were handling the condensate not only from the mains but the risers as well. Dripping the bottoms of the risers through traps would, of course, have lessened the tendency to hammer by draining off that amount of water.

Install Traps To Cure Pitch

As to the pitch of the mains, the specifications called for not less than 1 in. in 40 ft. This was intended to be the absolute minimum pitch, with more than that where possible in accordance with good practice. However, word seemed to have gotten around the job that 1 in. in 40 ft was all right everywhere. Such a small pitch is hard to measure and still harder to adhere to without some backgrading, and that was found to be the case with some of the smaller piping at the ends of the mains. This, of course, helped to cause hammering.

To cure all this, the traps were dropped down where possible to get a static head of water, or larger traps were installed. And where the head room was limited, extra traps were installed at intermediate points in the mains, and the mains were regraded as far as possible. However, this all cost money.

Is Pipe Undersized?

One opinion expressed during this argument as to who was to be held responsible and who should pay was that when condensate pumps were substituted, the drip traps should have been increased in size. It was argued that vacuum pumps accelerate the removal of air from the system and, by pulling a vacuum in the return line, increase the differential across the traps enough to improve their capacity to a considerable extent.

A similar argument rose over the pipe sizing, especially that the ends of the steam mains and most of the return mains should have been increased. It was pointed out that, with a vacuum pump, not only is the initial steam flow accelerated but under normal conditions the subatmospheric pressure in the return lines increases the pressure differential which causes the steam to flow through the system. This permits the use of a higher pressure drop in all the piping without raising the initial pressure and without loss of circulation.

Therefore, when the piping is sized for vacuum operation, it should be changed for atmospheric returns with a condensate pump. The pipe sizing tables issued by at least one manufac-

turer show larger mains for condensate pumps than for vacuum return lines. See Fig. 2. The difference is even greater in the return mains.

It was pointed out in rebuttal, however, that neither the ASHAE Guide nor the engineering data issued by the Heating, Piping and Air Conditioning Contractors National Association supports this argument, and it was left merely as a debatable point.

The lack of differential across drip traps when turning on the steam is recognized by the New York City Housing Authority. The Authority now includes a table in the job specifications, stating that these traps shall be rated on a 4 oz pressure differential for the following capacities in pounds per hour;

¾	in.	75 lb
1	in.	175 lb
1¼	in.	425 lb
1½	in.	850 lb
2	in.	1775 lb

In the apartment group case, the owner and consulting engineer were able to place the responsibility for changes on the contractor, who was obligated by the contract specifications to deliver a system which would circulate steam noiselessly at all times. The contractor had a loophole for action against the control manufacturer, because the specifications also said that whoever furnished the control must be satisfied with the traps selected.

2 Put Air Vents in Low Returns To Prevent Vacuum

A control valve operating on the "on and off" cycle was installed as part of a vacuum return line system. In this case, the vacuum pump was essential because some of the returns had to come back low with a lift to the pump, as shown in Fig. 3. When the job was put into operation, it was found that at times there was low water in the boiler, causing the automatic feeder to work, and then shortly afterwards the boilers flooded so that water had to be drained out.

The fault here was that when the control valve closed with the system full of steam, the condensation of that steam pulled a vacuum, sometimes as high as 20 in. WG, in the system. In accordance with usual practice, the pump was set to stop at 8 in. So, whenever the control valve closed, there was insufficient vacuum to lift the water out of the returns which became flooded and caused low water in the boiler, which in turn made the feeder operate. Even if the vacuum switch were set up high, there would still not be enough vacuum to keep the low returns dry, and under normal operation the vacuum would be excessive. Then, when the control valve opened again, breaking the vacuum, the water came back with a rush and flooded the boiler.

Ordinarily, all this could have been cured by installing a vacuum breaker at the pump, but the low returns prevented that easy correction. Actually, air vents were installed in all the return lines which came back low, as indicated in Fig. 3. These not only prevented the formation of a vacuum but, by maintaining atmospheric pressure at these points, the vacuum at the pump lifted the water at all times, even with the control valve closed. Of course, it would have been better in the first place to have the returns come back by gravity to an accumulator tank, with the lift between the tank and the pump. As it now stands, the only function of the vacuum pump is to lift the water out of the low returns.

3 Blocked Main Causes Manager To Disconnect Control

Take now the case of an existing building where controls were installed and trouble resulted. This was a very large office building, and the manager was well aware of the fact that he was using far too much steam. The trouble wasn't in the boiler room because he purchased steam. He knew it was in utilization, so he called in the representatives of several control manufacturers. He made what he thought was the right selection and had several control valves installed to provide zones. Almost the first day, there was a flood of complaints.

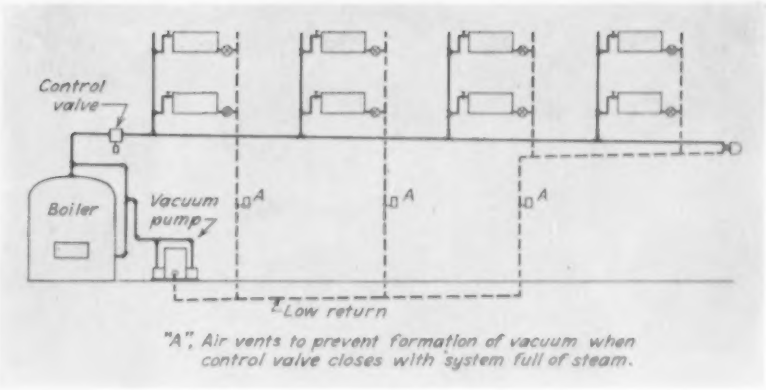
Analysis of these complaints showed that they came mainly from rooms on a group of risers in one corner of the building. The rest were scattered without any pattern. Most complaints were lack of heat but some were noise. Where the complaints were concentrated in the one corner of the building, it was found that a branch main in the basement feeding all the risers in this section was trapped. The other complaints were largely due to backgraded and trapped radiator runouts. The immediate reaction was to disconnect the controls.

What must be realized is that when this building was first occupied, there was a lot of hammering and bad circulation. This had never been corrected but had been reduced to where it wasn't too bad by raising the steam pressure. This had the effect, assisted by the vacuum pump, of blowing the water out of the trapped points. It was necessary to keep steam on at a good pressure all the time, that is, to maintain a high differential between steam and return mains. But the moment the control valves were put in, this differential no longer existed, or at most only occasionally.

"Continuous flow" systems necessarily work most of the time on a small differential. "Intermittent flow" systems build up a high differential only when the control valves are open — which, of course, is only part of the time — and when the valves are closed there is no differential. Therefore, water will accumulate at the trapped points and either stop circulation entirely at times or, at best, cause erratic circulation and create conditions for water hammer.

The moral is that, before any control system is installed in an existing building, the piping should be gone over thoroughly to see what its condition is and corrections should be made accordingly.

3 AIR VENTS were installed in return lines to prevent vacuum formation, thus permitting vacuum at pump to lift water at all times, even with control valve closed. Previously, when control had closed with system full of steam, condensation pulled a vacuum as high as 20 in. WG. As pump was set to stop at 8 in. WG, insufficient vacuum to lift water out of returns caused low water in boiler, which made feeder work and flood boiler



"A", Air vents to prevent formation of vacuum when control valve closes with system full of steam.

4 Unzoned Apartment House Leaks Air, Knocks Out Heat

Another common cause of trouble with heating control is bad windows. This is more usual in an old building, but actual experience in a new building serves to emphasize the point. This was a 14 story apartment house, a long and rather narrow building on a height of land with no protection from the wind on all sides. The long walls faced northwest and southeast. Steel casement windows were used. Two control zones were considered but the cost of installation was found to be substantial and it was decided to put up with what unbalanced heating might take place on the few really bad windy days during the winter.

However, it was soon found that on such days not only was there a difference of more than 10 F in the rooms on opposite sides, but in addition it was impossible to get the rooms on the windy side up to a proper temperature, even with steam on steadily at full pressure.

Investigation showed that the windows were leaking so badly that the cold air blowing across the outlet grilles of the convectors was throttling the stack effect of these convectors so much that they were not giving off their full heat. In addition, air was flowing straight through the building, that is, in through the northwest windows and out through the southeast windows.

The windows were worked over, and in some cases double windows were put on. Even so, the difference in temperature between rooms on the two exposures was far more than expected. It was concluded that it would have been wiser to spend the money for two zones to begin with. Had there been more protection from surrounding buildings this would not have been so necessary.

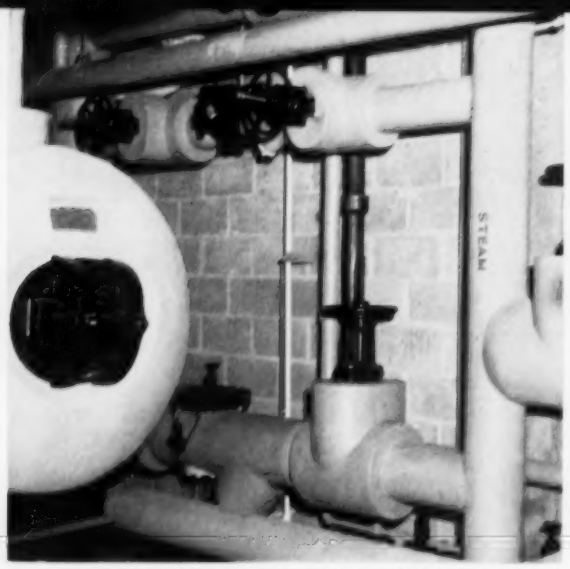
5 Open Windows To "Air Out" Bank, Overtax Control

Earlier, the psychological aspect of heat control was mentioned. If tenant habits may be considered psychology, then here was a good example in a Wall Street office building largely occupied by a bank. No control was included in the original construction a good many years ago but, as the art of heat control developed, the owners decided that they should take steps to cut down their excessive fuel bills. Since steam was purchased, there could be no improvement in the generation but only in the distribution and utilization. A contract was made with a manufacturer involving a guarantee of savings.

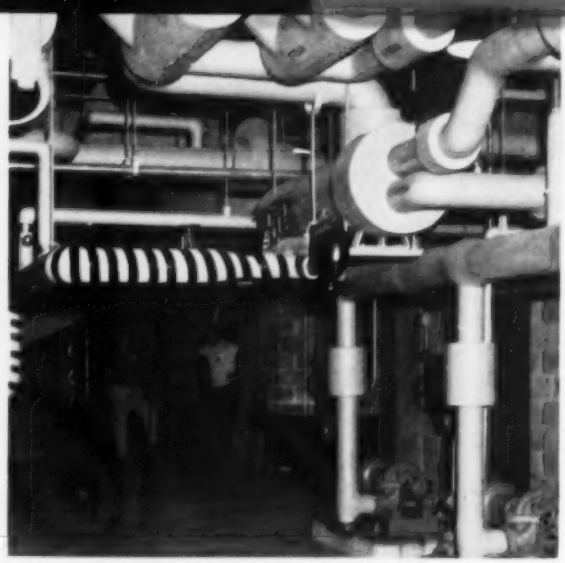
Unfortunately, the installation was not completed and ready to operate until the middle of the winter. There was immediate complaint from the occupants of the banking quarters over lack of heat. Weeks were spent in trying to rebalance the system and modify the operation of the controls, but the complaints persisted. The building manager insisted on turning on the heat to such an extent that very little saving was being made and the manufacturer was in serious danger of being penalized a substantial sum of money. Finally, it was found out that the banking staff itself was the unwitting cause of the difficulty.

In all the previous years of occupancy, it had become the custom to open the windows in the banking quarters wide every morning before working hours to "air out." The truth was that the rooms were being so grossly overheated that they had to be cooled down. It was not a matter of "airing out" in the sense that the air was stale. It was simply too hot. With the control in operation, there was no overheating, but the bank guards kept right on with their habit of opening the windows. The control did not and could not provide the extra heat at that time to offset the cold air let in. As soon as this habit was discovered and brought to the attention of the management, all was well. However, all this took a lot of time and was not cleared up till well towards the end of the heating season, with the resulting failure to meet the guaranteed savings. Because the owners decided that they would rather have a good control than exact a penalty from the supplier, the guarantee was extended to cover the second year, when it was met.

Two morals can be derived from this case. First, don't start a heat control system in the middle of winter. If the building has been overheated, the occupants notice the reduction in heat and think they are being cheated. Second, don't overlook the psychology of tenants. ✣



STEAM PRESSURE REDUCING STATION inside technical services building reduces pressure from 125 psig to 68 and 65 psig through two valves



HEAT EXCHANGER for hot water heating system supplies water at 180 F to finned pipe radiators and to reheat coils for conditioned air

Piping Performs 16 Services For

Piping for the technical services building at the Atomic Energy Commission's Portsmouth gaseous diffusion plant includes: acid, sanitary, and storm drainage systems, a radioactive disposal system for contaminated solutions, and service piping for burner gas, oxygen, hydrogen, fluorine, compressed air, hot and cold water, vacuum, high and low pressure steam, nitrogen, and distilled water.

THE TECHNICAL services building of the Portsmouth, Ohio, atomic energy project provides laboratory facilities for control analyses and development work for the gaseous diffusion plant. The building, a two-story reinforced concrete structure with first floor on grade, was designed with the idea of achieving an economic building unit of the most readily available materials, and still maintain the flexibility needed for a laboratory building.

The flexibility of design is demonstrated by such things as facilities on the south side for future expansion, pipe spaces at each laboratory for any changes in utility requirements, and movable partitions between laboratory areas for unpredictable and fluctuating space needs.

The building plan is rectangular, 290.58 ft long and 179.67 ft wide, with a two-story wing on the front 113.67 ft long and 40.00 ft wide. The total gross floor area is 113,511 sq ft.

Pipe Chase Houses Services

The pipe space or pipe chase has a 3 ft, 6 in. clear width between block walls and is open between ground floor and roof slab, except for a walkway at the second floor level. It carries laboratory piping, ventilation exhaust ducts, and electrical bus duct and conduits, and provides access to them and similar items as control valves and switchboards. Mechanical and electrical services are planned on a 12 ft module to meet any changes in utility requirements for the various laboratory rooms.

While it was necessary to have a pipe space large enough to accommodate installation and maintenance of ducts and piping, any unnecessary space would have been uneconomical. Piping installation proved a little difficult in a few locations. However, the design width appears to be adequate and economical.

Noncontaminated Piping System

Piping for the technical services building includes sanitary, acid, and storm drainage systems, plus a contaminated system. The drainage system is composed of extra heavy cast iron soil pipe and galvanized recessed drainage pipe and fittings. All horizontal waste piping within the laboratory units is high silicon iron pipe but the waste piping is of

By Richard W. Ulm,
Walter J. Hamer, and
Gene P. Rutledge
Carbide Nuclear Corp.

and

Lewis H. Rogers
Southern California
Air Pollution Foundation

PORTSMOUTH ATOMIC PROJECT's technical services building, designed for economy and flexibility, houses laboratories

Industrial Atomic Laboratory

extra heavy cast iron construction. This sanitary system discharges to the storm sewer system, and, even though small quantities of acid may be discharged from the laboratory units at times, it is not considered an "acid waste" system.

The laboratory sinks and wastes which are considered "acid wastes" are served by a system of waste and vent piping which is generally constructed of high silicon iron pipe and fittings and discharges to a belowground waste storage and neutralizing facility. Neutralized wastes are then discharged to the storm sewers. The storm drainage system consists of roof sumps, internal roof conductors, and a system of building drains leading to the storm sewer in a conventional way.

Hot Tank for Radioactive Waste

The contaminated piping system of waste and vent piping is designed to serve three radioactive waste sinks in the radiochem laboratory. These three sinks are the only sinks in the building in which radioactive materials are to be dumped, and they are designated "hot sinks." The drainage pipe and fittings are of stainless steel.

This system discharges to a holding tank—hot pit—via an underground trench outside of the building, pending final disposal. The holding tank is constructed of Type 347 stainless steel and has a capacity of 500 gal. It includes a 15 in. diameter access manhole, a level indicator and a sampling thief float and rod, all of which are constructed of stainless steel. The tank also has a 50 psig steam ejector system and a compressed air connection for tank agitation when the storage tank is to be emptied. This storage tank is approximately 25 ft west of the technical services building.

Final disposal depends upon the concentration of the radioactive material. This system was designed for comparatively "warm" rather than very "hot" solutions. The material in the holding tank is diluted with water until the concentration of contaminants is low enough to meet the requirements and specifications for normal sewer disposal. Solutions that are "hot" and cannot be diluted in this manner must be handled by other means.

Test runs using water indicate that the system operates as designed without any apparent difficulties.

Mains and Branches Grouped

A group of service pipe mains together with branches convey the services to all laboratories. The main portion of this distribution system is installed in the pipe spaces provided. Valved takeoffs are provided for such services to existing laboratories and anticipated future installations on the basis of 12 ft modules. The service, symbols, and laboratory cock color codes are consistent with the color scheme used on piping throughout the Portsmouth plant for pipe identification purposes.

Gas System. Oxygen, burner gas, and hydrogen originate in the gas manifold building. The nitrogen and compressed air supply enter the north side of the technical services building from the main plant distribution system at 50 and 100 psig, respectively. The nitrogen is then metered and reduced to 6 psig and at this pressure is distributed to the laboratory building piping system, whereas compressed air is reduced to 55 psig.

PIPE CHASE, with 3½ ft clear width, is open from ground floor to roof slab except for second floor walkway

HOT TANK for storing radioactive waste has a 50 psig steam ejector system and a compressed air connection for tank agitation

Distilled and Chilled Water. The water still and storage tank for distilled water are in a heated penthouse on the roof of the technical services building, in order to obtain a head for ample gravity flow to the aluminum piping system. Considerable difficulty was experienced in the operation of the water still because of the excessive hardness of the area water. Solid deposits accumulated so fast in the evaporation chamber that the chamber and deconcentrator would plug in only seven days of operation. To eliminate this problem, feed for the water still was modified to utilize steam condensate from the flash tank and condensate systems. Since the steam condensate was in the first floor, a domestic water system was used to deliver automatically the condensate to the higher elevation.

Packaged chilled water units with water regulators for film processing are installed in the dark rooms.

Vacuum. The vacuum system originates in the west mechanical equipment room in the form of a 200 cfm high vacuum type pump. This unit is complete with oil seal, oil separator tank, oil line solenoid valve, and a control system with pressure operated "mercoid" switch. It has a blank-end test of 10 microns or better. The vacuum is then connected by a piping system to all laboratory outlets requiring this service. The vacuum system is for air and water vapor evacuation rather than for corrosive gases.

Cold Water. The cold water supply is obtained from the main plant sanitary water system and enters the west side of the Portsmouth technical services building in an underground 4 in. pipe line. At this point, it is distributed to various installations requiring make-up water, to all the required outlets in the various laboratory rooms, and to toilets, shower rooms, and emergency showers located throughout the building.

Normally, sanitary cold water from the main plant distribution system is used for cooling water for the mass spectrometers. This water is obtained from the 4 in. cold water supply to the building and piped to a 1000 gal storage tank, through the mass spectrometers and back to the west mechanical equipment room, where it is discharged to the sewer system. In the event of a drop in supply line water pressure or a discontinuation of this sanitary cold water, automatic valves close the fresh water supply to the tank and close the discharge drain line, and the system operates by a pump on a recirculating cycle. This cycle is from the storage tank, through the mass spectrometers, and back to the storage tank again. This water will gradually rise in temperature; but the storage tank capacity of 1000 gal seems sufficient for an emergency.

Hot Water. The sanitary hot water supply system originates in the west mechanical equipment room, with a 1200 gal domestic hot water storage tank and heater. This piping system is so designed that the piping includes a recirculation pipe line back to the hot water storage heater. This prevents delay in obtaining hot water at distant outlet locations.

This hot water supply system not only supplies toilets and showers, but is also distributed to all laboratory locations requiring this service.

Steam. A 6 in. 125 psig steam supply line is piped from the main plant distribution system into the west side of the technical services building. At this point inside the building, it is reduced to 68 and 65 psig through two pressure reducing valves. The 68 and 65 psig steam system supplies this equipment:

1) The building unit heaters.
2) The hot water storage heater coil.
3) The preheat coils of the air conditioning units.
4) A pressure reducing valve (65 psig to 5 psia).

The low pressure steam system—5 psig—supplies the following equipment:

1) Steam supply to laboratory tables and equipment.
2) Converter for the recirculating hot water heating system.

Recirculating Condenser Water Supply and Return System. This system is not for general laboratory use. This recirculating plant water is used for cooling the two fluorinated hydrocarbon refrigerant (No. 12) condensers of the air conditioning system and is recirculated back over the plant cooling towers. The condensers are so sized that a maximum of 3000 gpm at 95 F water is required on a 95 F summer day.

Hot Water Heating Supply and Return System. This system is used only for building heating. It is distributed to various finned pipe radiators and is also piped to all reheat coils for the conditioned air supply. The supply temperature of this water is approximately 180 F. Sanitary cold water is fed into this piping system under control of a pressure regulating valve set at 20 psig to maintain a constant operating pressure in the system.

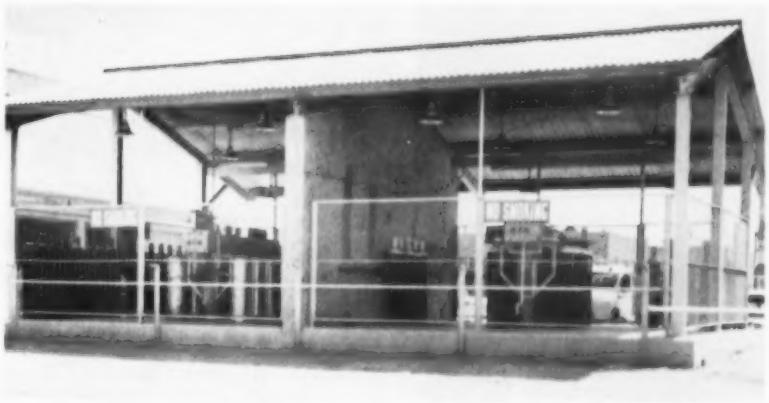
There is also a ½ in. 55 psig compressed air line connected to the top of the expansion or compression tank. This can be used to facilitate tank drainage or to replace a water logged air cushion in the expansion tank with new air. An evident symptom of a water logged expansion tank is frequent operation of the system relief valve.

The heat exchanger—low pressure steam heats the recirculating water—is not too well designed with regard to future maintenance, as access to the tube bundle is difficult.

Gas Manifold System Is Complex

The gas manifold building is an 18 by 37 ft structure approximately 45 ft west of the technical services building. One 37 ft side is approximately 6 in. above grade, while the service drive on the opposite side is graded to provide a 3 ft 6 in. high truck dock.

The structure is of steel column, beam, and purlin construction, with open sides and a corrugated cement asbestos roof. One midwall, which divides the building into two approximately 18 ft square sections, is of reinforced concrete. The floor is a slab on original ground or compacted fill. No heating or ventilation is required.



GAS MANIFOLD BUILDING houses gas cylinders equipped with piping manifolds, from which underground lines of 1 in. copper tube inside 2 in. steel pipe supply the laboratories

Each cylinder manifold has a 1 in. solenoid valve—explosionproof type, 15 psig operating pressure—which is operated by a pressure electric switch, providing an automatic changeover from the empty bank of cylinders to the full bank, sounding an alarm, and turning on an indicating light in the mass spectrometer room of the technical services building. The alarm, also in this room, can be turned off immediately, but the light will remain on until the empty cylinders have been replaced.

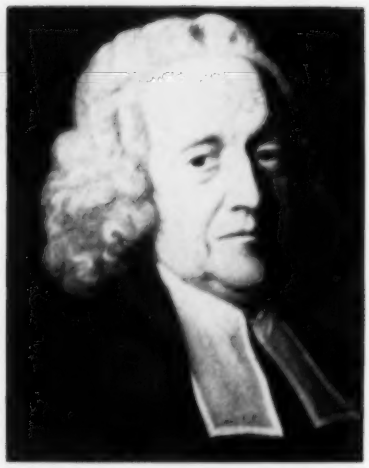
The oxygen manifold station consists of two manifolds, each connected to five 9 in. oxygen cylinders, giving a total of 10 cylinders. The oxygen enters the technical services building through an underground 1 in. copper tube pipe—inside a vented 2 in. steel pipe—on the west wall of the technical services building. At this point inside the building, a station is installed to reduce the pressure from 15 psig to 6 psig, and the oxygen is then distributed to the building. The pressure reducing valve is sized to give a flow of 25 cfm at 14.7 psia.

The burner gas manifold station has a hydraulic back pressure valve of the nonfreeze type for safety protection against an explosion. Otherwise, it is similar to the oxygen manifold station.

The hydrogen manifold station consists of two manifolds, each connected to two hydrogen cylinders, giving a total of four cylinders for this station capacity. The station also has a hydraulic back pressure valve of the nonfreeze type. Hydrogen is run underground outside of the building in a 1 in. copper pipe—inside a vented 2 in. steel pipe—entering the technical services building, above grade, at the north wall. A pressure regulator is installed at the manifold station to reduce the pressure from 20 psig to 6 psig before being piped into the glass shop.

Fluorine is piped at moderate pressures to the gas manifold building, where a manual shutoff valve is located. Here the seamless steel Schedule 80 pipe is reduced from 2 in. to 1 in., and it is then run overhead to the west wall of the technical services building to provide a valved outlet in the coolants room.

The architect engineers for the Portsmouth technical services building were Smith, Hinchman, and Grylls, Inc. and the general contractor was Steenberg-Leck. Mechanical design coordination was by G. W. Anderson and supervision of all design by R. M. Batch and S. Cromer, all of Carbide Nuclear Corp. The gaseous diffusion plant is operated for the AEC by the Goodyear Atomic Corp. Photographs courtesy of Goodyear Atomic Corp. ✣



STEPHEN HALES, 18th century inventor, designed ventilation systems for hospitals, prisons, ships, and the dusty trades

Stephen Hales:

Lacking most of the equipment and much of the store of knowledge we possess, he arrived at conclusions which are surprisingly valid today.

RECENTLY, an original copy of the first edition of Hales' work on ventilation, *A Treatise on Ventilators* (London: 1758), was added to the Allen Memorial Library at the American Society of Heating and Air-Conditioning Engineers Research Laboratory at Cleveland. While no attempt is made here to give an exhaustive review of this book, there are several interesting points drawn from the author's own achievements which illustrate the early progress in mechanical ventilation 200 years ago.

Stephen Hales, English physiologist and inventor (1677-1761), was one of the outstanding investigators and scientists of his time. He was the first man to measure blood pressure and to describe the flow of sap in trees. He established the relation of the spinal cord to reflex movements and described many other important facts in the fields of human and plant physiology. In fact, his interests and investigations extended into a surprising number of fields.

Here, however, we are interested mainly in his contributions to the art of air conditioning.

ROOFTOP WINDMILL was used to operate central ventilation system in Newgate prison

Established Important Data for Future Work

Hales observed that some infections "too subtle to be seen in the air" are a frequent cause of disease and he advocated, designed, and supervised the installation of a large number of mechanical ventilation systems to purify the air in hospitals, prisons, ships, and in the dusty trades. Prophesying a great future for this art, he established important data for its development.

He developed portable ventilators for abating "frowzy vapors" in the home and sickroom. Also, he considered the effects of humidification on the air we breathe. He established methods for determining the purity and safety of air in mines and designed an air washer for cleaning the air in mine shafts.

Reduced Deaths from Epidemics

His earlier work in the ventilation of overcrowded ships carrying troops to America and slaves from Africa had clearly shown the possibility of reducing the tremendous loss of life due to epidemic diseases in crowded spaces.

In 1752, he designed and supervised the installation at Newgate prison of a central ventilation system, operated by a windmill on the roof, with ducts to the various wards. The sanitary conditions in many prisons

18th Century Ventilation Authority

By Howard C. Murphy
Consulting Engineer

at that time were appalling. There were no windows and as few doors or other openings as possible. This was due to the so-called "window tax," a government levy on the number of windows or other openings in all buildings. Thus, the problem of ventilating a "windowless" building was not unknown two centuries ago.

In any event, Hales demonstrated that the ventilation of the prison decreased the prevalence of certain "distempers," and what was considered of much more importance, it prevented the infection of the king's judges on the bench.

He subsequently installed mechanical ventilation systems actuated by windmills, waterpower, and manpower in many "gaols" throughout England. He not only installed such systems in many of the leading hospitals in England, but through his suggestions and advice these systems were installed in several other European countries.

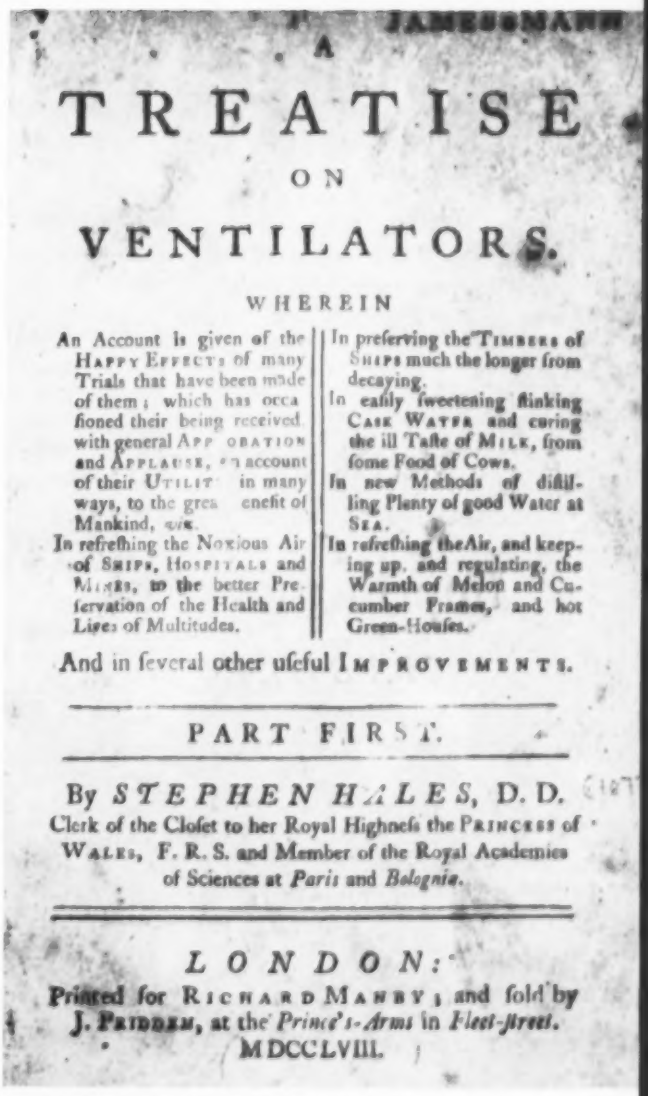
Hales Award Recommended for Air Conditioning

Hales studied the causes of hurricanes and the temperature of sea water at various depths and in various climes. He advocated the distillation of sea water and reported on some of the electrical characteristics of the air.

His observations on electricity paralleled those of another member of the Royal Society whom we honor for his work in air conditioning, Benjamin Franklin, who was American Commissioner in London at that time.

Hales' work in the field of plant physiology has been recognized by the American Society of Plant Physiologists in the establishment of the "Stephen Hales Award," which is awarded each year to some person who has served the science of plant physiology in some noteworthy manner.

It would seem fitting that a similar award be created by the ASHAE to honor some person each year, whether a member of the Society or not, who has made an outstanding contribution to the progress of air conditioning.



A
TREATISE
ON
VENTILATORS.

WHEREIN

An Account is given of the HAPPY EFFECTS of many Trials that have been made of them; which has occasioned their being received with general APPROBATION and APPLAUSE, on account of their UTILITY in many ways, to the great benefit of Mankind, viz.

In refreshing the Noxious Air of SHIPS, HOSPITALS and MINES, to the better Preservation of the Health and Lives of Multitudes.

In preserving the TIMBERS of SHIPS much the longer from decaying.

In easily sweetening stinking CASK WATER and curing the ill Taste of MILK, from some Food of Cows.

In new Methods of distilling Plenty of good Water at SEA.

In refreshing the Air, and keeping up, and regulating, the Warmth of Melon and Cucumber Frames, and hot Green-Houses.

And in several other useful IMPROVEMENTS.

PART FIRST.

By *STEPHEN HALES*, D. D.
Clerk of the Closet to her Royal Highness the PRINCESS of WALES, F. R. S. and Member of the Royal Academies of Sciences at *Paris* and *Bologna*.

LONDON:
Printed for RICHARD MANBY; and sold by J. PEDDER, at the *Prince's-Arms* in *Fleet-street*.
MDCCLVIII.

BOOK ON VENTILATION was written by Hale 200 years ago. Title page shown here is from an original copy of the first edition

How To Read Faster and Better

If you're too busy to read all the articles, books, and other literature necessary to keep abreast of the field, you'll profit from this article. By improving your reading efficiency, you can save valuable time and not miss out on important current publications.

By Nila B. Smith

Director, The Reading Institute
New York University

Do you know how well you read? The first thing to do is to find out. Very good readers read 500 or 600 words per minute. A very superior reader reads 1000 words a minute. Ability to cover printed words rapidly, however, is quite valueless unless one gathers meaning from reading as his eyes travel over the lines of print. If you are to increase your reading ability, two basic skills need to be developed: speed and comprehension. Comprehension must keep pace with speed or all is lost.

How To Increase Speed

Speed is the easiest part of the reading process to develop. The rapid reader's eyes move fleetingly across the lines, pausing briefly two or three times on each line, and picking up an "eyeful" of words at each pause.

To increase your speed, you must set your mind on developing long, rhythmic eyesweeps, with fleeting pauses that gather in everything in visual range. Speed is achieved by increasing the rapidity of the eye movements, decreasing the length of the pause and taking in a larger number of words during each pause. Don't point, don't say the words with your lips, and don't move your head.

Desire, determination, and practice are the basic ingredients for reading improvement. Begin your practice by getting yourself in quiet surroundings, look at the title of the article you are about to read, decide why you want to read this article, and make up your mind to read fast, faster than you've ever read before.

How To Read Paragraphs

In learning to read paragraphs effectually, you must master the art of quickly grasping the essence of each of these thought units. Expertness in "spotting" the basic thought in each paragraph is the skill that you need to cultivate in order to do this kind of reading efficiently and in the shortest possible time.

If you wish to read and consider the details carefully and to remember them, the central thought in a paragraph provides you with a core around which you can readily organize the details.

In "spotting" the main idea in a paragraph, you should ask yourself two things: 1) What is the basic thing, place, condition, or person discussed in this paragraph? 2) What does this thing, place, condition, or person do, or what is done to it, or what property does it have, or what condition is it in which makes it worthwhile for the author to say something about this topic on paper?

Heed the Sign Posts

Printways are similar to trailways in that they, too, are posted with signs which aid the reader in finding his way quickly and surely to his reading destination. What are these signposts? Usually they are words, occasionally phrases.

One group of these direction words tells you to proceed ahead with all speed. Some of the most commonly used signal words in this group are: *and, more, moreover, more than that, furthermore, also, likewise.* Another group of "go aheads" signals you to continue on, but they tell you that you are about to come to a stopping place. Some of these are: *as a result, finally, and in conclusion.*

In opposition to these "go ahead" words, we have another group that serves to turn the thought sharply in a different direction. The most common of these adversative words is *but.* There are other words and phrases which also negate preceding statements with equal effectiveness, such as *yet, nevertheless, otherwise, although, despite, in spite of, not, on the contrary, however, notwithstanding.* When you come upon such words as these, prepare yourself for an abrupt change. Travel with the author and you'll reach your destination more quickly and more accurately.

How To Read, Recall Details

Finding the main ideas in paragraphs is your starting point in learning the next step, that of grasping details. This section is directed toward the dual purpose of helping you: (1) to read and comprehend detailed facts as rapidly as possible,

Dr. Nila B. Smith is recognized as one of the leading authorities on reading in the United States. This article is condensed from her new book, Reading for Adults, copyright 1956 by Prentice-Hall, Inc.

and (2) to remember those facts once you understand them.

First, find the main idea in each paragraph. Then find the important details that relate to this main idea. As you read, think of the main idea as a magnet drawing the particles toward it, the "particles" being the smaller and detailed ideas. Then visualize the main idea together with its cluster of subideas as a unit in itself.

In a nutshell, these are the processes which will enable you to grasp and hold in mind a series of minor factual details. A word of caution: Don't try to understand or to recall one isolated fact without thinking of it in relation to the main idea and associating it with the total thought.

Adjust to Different Patterns

When you are about to read a selection, you should decide which pattern the author used in writing the selection, and then adjust your reading to this pattern. The most common patterns are: (1) to share an experience, (2) to impart information, (3) to express opinion together with reasons, (4) to state a question and give the answer, and (5) to draw a conclusion and substantiate it with facts.

It is easy to identify the "sharing experience" pattern. Simply answer this question to your satisfaction: "Is he telling about some actual, first-hand experience?" Additional clues are the use of the personal pronouns *I, we, our, us.*

The "question-answer" pattern, as the name implies, is one in which the author states a question, then proceeds to answer it. The question may be stated as the title of the article, as a subheading within the article, or at the beginning of a paragraph. It often appears as an "interest tickler."

The "imparting information" pattern is also easy to identify but often difficult to read. Frequently this pattern contains many factual details. You must be prepared to adjust your speed to careful, detailed reading.

The "opinion-reason" pattern is, as its name implies, the pattern in which the writer states an opinion and gives his reason or reasons for this opinion. Some clues to look for are such phrases as *I think, I believe, I prefer, I judge, I am sure, in my opinion,* etc.

The "substantiated facts" pattern usually begins with a conclusion and is followed by facts which prove that this conclusion is true. It is most frequently found in technical or scientific content. In identifying this pattern, look for a definite statement in the form of a conclusion. This statement will seldom contain personal pronouns or such verbs as *think* or *believe.* It is usually a terse statement of fact.

Synchronize your purpose and techniques to the author's style and there will be no lost time or effort.

How to Preview a Selection

In some cases, the preview will provide you with all the information you desire, and you won't find it necessary to read the selection at all. In other cases, the preview will "whet your appetite," increase your interest, and strengthen your personal motive for reading.

The first step is to study the title. It tells you concisely what the selection is about. Next, glance at the subheadings if any. These subheadings are the major topics in the author's outline. Look carefully at the illustrations; they will aid in your comprehension of the article. For the fourth step, ask yourself what the author's purposes were in writing the article which will help you in identifying the pattern of writing.

If you will study these characteristics, they will afford you very valuable pre-reading insights.

How To Skim

The ability to skim expertly makes it possible for you to clear your desk more rapidly than any other technique. A different type of eye movement is often used in skimming.

To skim, you need to develop two new abilities: (1) the ability to "skip over" unimportant words and sections of content which are not pertinent to your purpose, and (2) the ability to use vertical as well as horizontal eye movements.

You must learn to catch only the important words that convey the bare ideas, and let the rest go by.

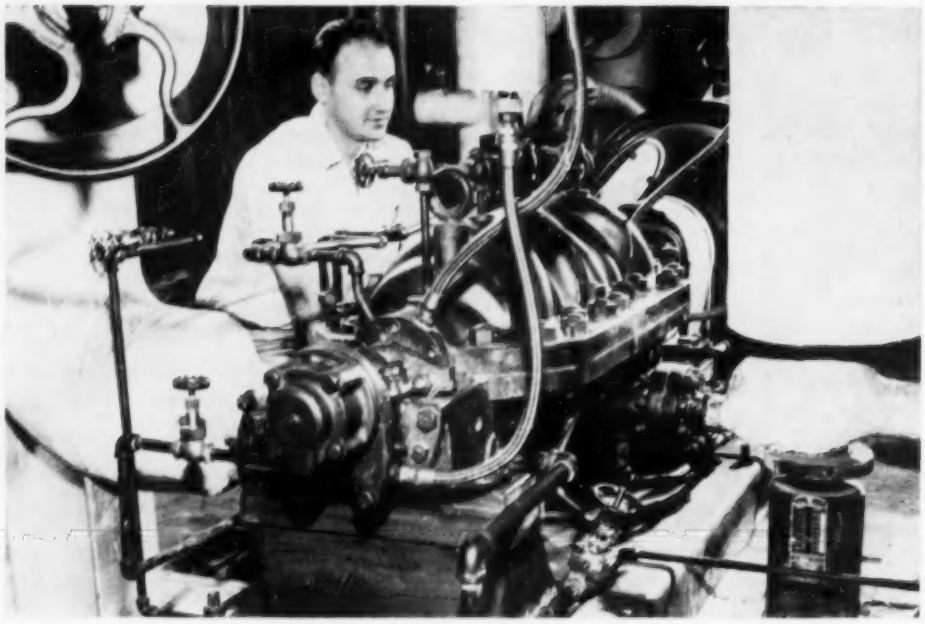
Flick the pages through hastily, taking fleeting glimpses at the chapter titles. Should any of the titles intrigue you, note subheadings and visual aids. Skimming is really a superspeed which comes as the result of stepped-up practice.

How Well Do You Read Now?

Keep on practicing these techniques, and keep on improving. No end points have been found for the number of words per minute which an individual can read, nor for the depths of comprehension which he may attain. The frontier is open to all who care to adventure into the realm of reading improvement. ✠

10 RULES FOR RAPID READING

1. Develop speed with long, rhythmic eye sweeps.
2. Learn to spot the basic idea in any paragraph.
3. Follow the sign posts the author has set out for you.
4. Learn to recall details.
5. Synchronize your purpose and techniques to the author's style.
6. Learn to recognize the pattern the author uses.
7. Learn to preview a selection for valuable pre-reading insights.
8. Use vertical as well as horizontal eye movements in skimming.
9. Learn to pick out only the important words that convey the bare ideas.
10. Practice!



MULTISTAGE BOILERFEED PUMP rated for 125 bhp, 3550 rpm, 257 gpm, 265 F, 1360 ft total head, 581 psi discharge, and 18 ft NPSH serves a new industrial steam plant

When You Select Boilerfeed Pumps

. . . you'll find a system head curve a valuable tool in selecting the right pump for the right conditions

By Thomas F. Keating

Application Engineer,
Centrifugal Pump Dept.,
De Laval Steam Turbine Co.

IF YOU ARE considering the purchase of a new boilerfeed pump, a system head curve will help you choose the most economical and efficient operating conditions. Its use is essential for studies for determining brake horsepower savings possible with parallel operation, or with variable speed drive as compared with constant speed operation. It shows up some potential dangers of parallel operation.

What Is a System Head Curve?

A system head curve is a graph or chart of the head capacity characteristics of a piping system. It shows the pressure required to push any given quantity of water through a piping layout.

A simple cold water application of a system head curve is a pump lifting water from a well and delivering it to a higher elevation. The total system head against which the pump must operate is made up of the static head—or vertical lifts—plus a friction head due to the flow of water through the pipes. Static head can be obtained by linear measurement. Friction head must be obtained from a piping diagram showing pipe lengths, diameters, fittings, and type of pipe. There are tables available which tabulate these friction drops. The Hydraulic Institute Standards is one good source.

The sum of the static and friction heads for all capacities can be shown graphically by a system head curve such as curve *AB* of Fig. 1. Note that the friction portion of the curve rises with increased capacity, this increase being approximately proportional to the square of the velocity in the pipes.

The foregoing illustration applies to boilerfeed piping systems as well. The only difference is that boiler pressure, pump suction pressure—from deaerator or heater—and friction losses through the heaters, economizer, superheater, regulating valve, and other components must be considered. These losses can be obtained from the equipment manufacturers.

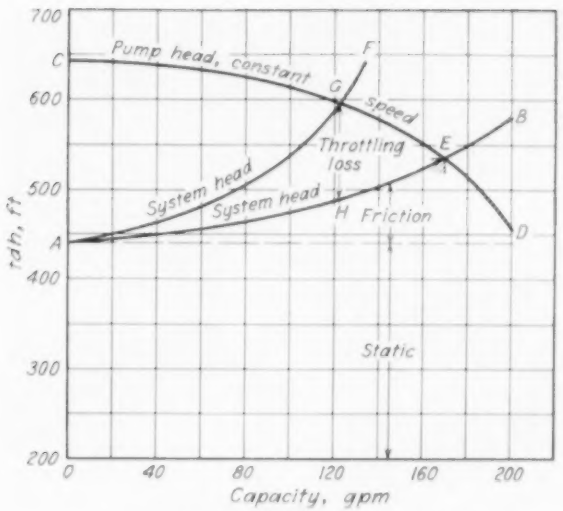


Fig. 1

SYSTEM HEAD CURVE *AB* is independent of the pump curve *CD* or *CF*. While the system head curve is calculated from a piping diagram showing pipe system details, the pump characteristic curve is a function of pump design, chiefly impeller diameter and rpm. When these two curves are drawn on the same scale, the pump automatically adjusts its delivery to the conditions at their intersection

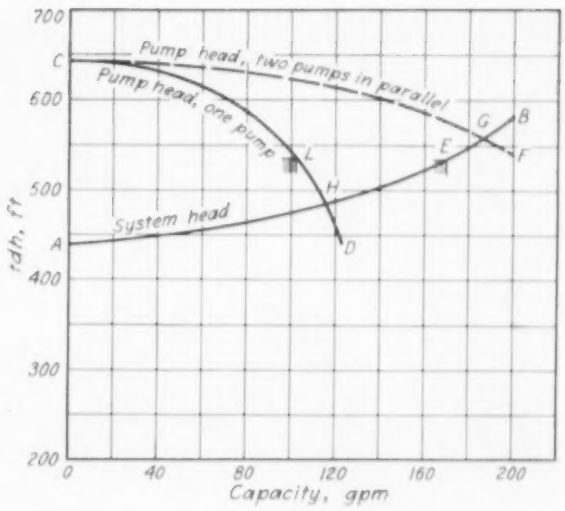


Fig. 2

Rated Pump Capacity ..... 170 gpm

Superheater outlet pressure	425 psig
Drop through superheater	15 psig
Drop through economizer	15 psig
Drop through regulating valve	40 psig
Drop through feedwater heater	10 psig
Drop through piping	15 psig
Static elevation	10 psig

Boilerfeed pump discharge pressure	530 psig
Boilerfeed pump suction pressure	10.9 psig

Since the total pump head, *tdh*, is discharge pressure minus suction pressure, then:

$$tdh = 530 - 10.9 = 519.1 \text{ psig} \quad \ldots\ldots [1]$$

A margin of safety is usually added to the *tdh* and in this case is 3 percent of total head:

519.1 × 1.03 = 535 psig *tdh*, or 1300 ft at 227 F. ....[2]

Hence, the system head curve will pass through 1300 ft at 170 gpm. By repeating the above calculations at other capacities, the system head curve *AB* of Fig. 1 is obtained, beginning at 440 psig *tdh* (535 psig minus total friction of 95 psig) at zero capacity, point *A*.

Independent of the system head curve is the boilerfeed pump characteristic curve *CD*, Fig. 1. This curve shows the head at which the pump will deliver any given gpm when operating at constant speed. It is a function only of pump design, chiefly impeller diameter and rpm.

If the boilerfeed pump head capacity curve is plotted over the system head curve as in Fig. 1, the intersection point *E* indicates the operating point. The pump will automatically adjust its delivery to this point.

In order to avoid confusion in understanding these curves, the following three rules will help:

1) The system head curve is independent of the pump curve, being calculated entirely from a piping diagram showing pipe system details.

2) The pump characteristic curve is independent of the system head curve, being a function of pump design, chiefly impeller diameter and rpm.

3) When drawn on the same scale, the pump automatically adjusts its delivery to the intersection point of the two curves.

Fluctuate Capacities by Varying System Head

As long as the pump rpm and impeller diameter remain constant, the pump must deliver along curve *CD*, Fig. 1, so that changes in capacity to part loads must be accomplished by varying the system head curve *AB*. This is done automatically in a steam plant by the regulating valve. By partly closing, the pressure drop across the valve is increased, creating a different and steeper system head curve *AF* intersecting the pump curve at point *G*. Each change in the regulating valve's position varies system pressure drop and changes that intersection point, and therefore, the pump operating point.

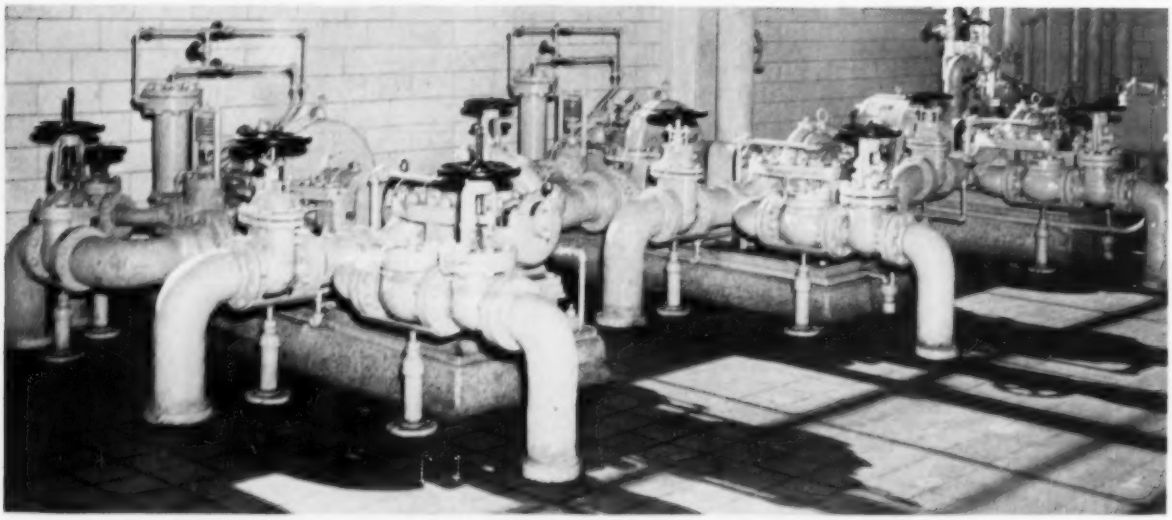
It can be seen that the above method is inefficient, in that a pressure drop is added to the system to reduce flow. The amount of added pressure drop is represented in Fig. 1 as the vertical distance between curves *AB* and *CD*. For system head curve *AF*, this loss is *gh*. The brake horsepower loss represented by *gh* can be approximated:

$$bhp = [(gh)(gpm)(sg)]/[(3960)(eff)] \quad \ldots\ldots [3]$$

where *bhp* = the brake horsepower; *gh* = the head in feet from Fig. 1; *eff* = the efficiency of the pump at *G*, gpm; and *sg* = the specific gravity at the pumping temperature.

Parallel Operation Also Used To Vary Capacity

A second method of varying capacity, used in many stations, is to divide boiler capacity among two or more identical pumps, making it possible to operate one pump alone for low capacities and two or more in parallel for intermediate and high capacities. The pumps can be cut in or out automatically as load varies. This allows each



MULTIPLE PUMPS in parallel can vary boilerfeed capacity and thus achieve possible brake horsepower savings. Each of the two turbine driven pumps and the motor driven pump is rated for 150 gpm, 4000 rpm, 575 ft total head, and 215 F

pump to operate nearer its maximum efficiency point at most boiler loads and saves throttling losses required if one large pump were used. This can be seen in Fig. 2. Here shown are two identical pumps each designed for 60 percent of boiler capacity. Each is represented by curve *CD*. When operating in parallel, the combined capacity is twice the capacity of each pump. By adding the capacities of the two pumps at each *tdh*, a combined head capacity curve *CF* can be drawn. The point of intersection of this combined curve *CF* with system head curve *AB* at point *G* is the new operating point of the two pumps in parallel.

Note that when operating singly, each pump delivers at point *H*. Operating together, the combined capacity is *G*, a higher *tdh*. If more pumps are added to the system for capacities beyond *G* gpm, the combined capacity will require a still higher *tdh*. For each pump this means it will operate at a higher *tdh* and lower capacity on its own curve. Therefore, for this type of capacity variation, it is desirable to specify pumps with fairly steep head capacity curves, in the order of 15 to 25 percent. Thus, delivery will be assured and maximum capacity obtained without each pump going too far back on its curve to meet the higher combined *tdh*. Also, the less the change in capacity from designed conditions, the less the efficiency decrease in each pump.

It can also be seen why it is important to have similarly rising pump curves with nearly the same shutoff pressure. If two or more pumps are paralleled and the regulating valve closes for decreasing demand, each pump falls back on its curve to a lower capacity and higher *tdh*. Should one pump curve be steeper than another due to dissimilar pumps or different driver characteristics—explained later—the steeper curve pump will "hog" the load. Should the *tdh* rise be drastic enough, it is possible that the flatter curve pump will be forced back to little or no delivery.

This can have serious consequences in that rapid temperature rise of the water sealed in the pump case can occur, caused by input *bhp*. The result can be flashing of the liquid in the impeller eye and vapor binding followed by seizing of the wearing rings and bushings. This means a serious repair job later. The pump manufacturer can advise a minimum safe flow above which no dangerous temperature rise and flashing can occur. A recirculation connection installed to bypass this minimum flow and used when pump capacity becomes low can minimize this danger.

Avoid Undersized Motor and Inadequate NPSH

Two other problems that require proper consideration in designing parallel installations are brought out by further examination of the system head curve, Fig. 2. While the pumps in Fig. 2 are designed for parallel operation at *L* gpm, singly they deliver at *H*, a greater capacity. Hence, a size motor must be selected large enough to carry pump *bhp* at *H* which will be greater than designed *bhp* at *L*.

Also, sufficient net positive suction head, or NPSH, must be available at the pump suction to allow the pump to carry out to *H*. Failure of the "available" NPSH of the system to be equal to or greater than the "required" NPSH of the pump at *H*, can result in harmful cavitation pitting of the pump suction impeller with the attendant noise and vibration. One of the first signs is a dropping off of capacity, head, and efficiency. By being forewarned of operation at *H*, the pump manufacturer will select the proper size pump with sufficient margin in NPSH for satisfactory operation at *H*.

The author will discuss variable speed drive in the next article on choosing boilerfeed pumps, to be published in an early issue. ⧺

NEW MENTAL HOSPITAL on an 800 acre tract has 14 major buildings, including medical, surgical, and ward buildings, boiler house, laundry, sewage disposal facility, five general "cottages," and two "disturbed" buildings

$21 Million Mental Hospital Gets Steam Service, Air Conditioning

Comfort for 3500 people in 14 buildings is controlled from a single point. Steam is reduced from 125 psi to 7 psi for heating and 40 psi for cooking. Unit heaters and ventilators are used in some areas. Surgical suites are air conditioned year 'round. Equipment is protected against tampering by patients.

By Alex Kay

Engineer,
Charles Simkin & Sons, Inc.

NEW JERSEY'S $21 million dollar state mental institution at Ancora, recently completed, includes a $1.8 million air conditioning, heating, and ventilating system. Air conditioning in surgical suites and steam heat in all major units of the 14—eventually 22—building medical center provide comfort for 2700 patients and 800 staff members.

The coordinated system responds automatically to changes in outdoor temperature and humidity, with a minimum of manual attendance or maintenance. Also, it was engineered to handle every anticipated overload condition, including a possible future expansion of the transmission system.

Besides supplying heat to the hospital's extensive wards, "senile" cottages, and "disturbed" buildings, the heating network delivers high and medium pressure steam for a laundry, kitchen, and bakery.

Steam Zoning Speeds Repairs

Seven to 14 separate networks drawing steam from the main loop serve each of the hospital's main buildings. Several essential advantages are realized through systematic breakup of heating circuits into relatively limited and completely independent heating sublines. A failure can be located with a minimum of groping and tracing and is contained in one small segment of the system. Intensive zoning localizes faults and thus immeasurably speeds repair of a ruptured or malfunctioning line.

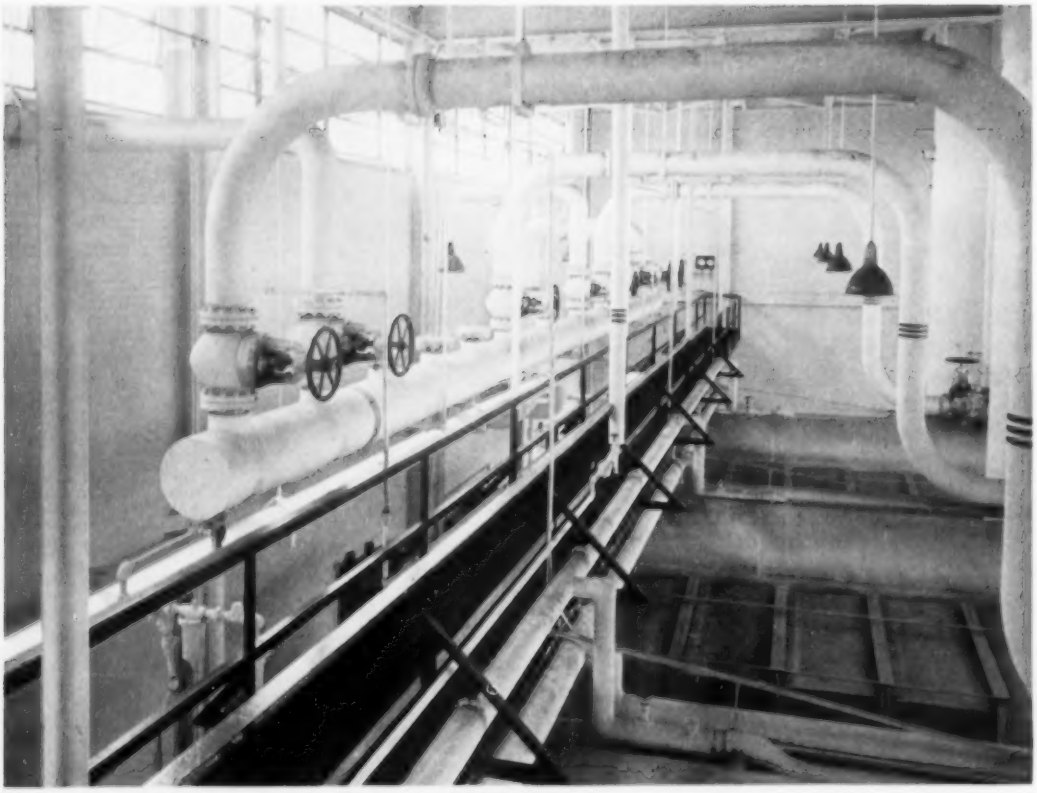
The source of the 7 psi steam for general heating is a 6 mile, high pressure steam main transmitting 125 psi steam generated by three package boilers in a large ultra modern boiler house. High pressures are reduced to 7 psi by pressure reducing valves and temperature regulators at header points that branch off the main loop. High pressure steam is reduced to 40 psi for cooking and sterilizing. Low pressure steam is used to heat domestic hot water stored in large quantities at numerous points of consumption throughout the hospital.

The output of each automatic boiler is rated at 25,000 lb per hr. Each single unit is capable of gener-

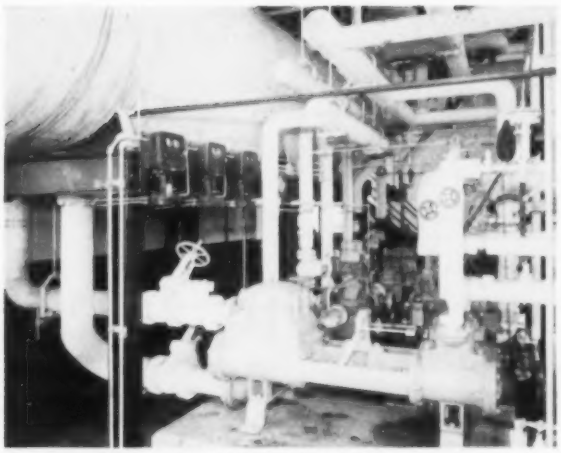
FEEDWATER TREATMENT storage and distribution section on balcony has five small watering pumps for neutralizing and demineralizing water

STEAM KETTLES AND OVENS use 40 psi steam for cooking meals for 700 patients. Steam pressure is reduced from 125 psi

. . . numerous valves and pneumatic controls modulate steam generation and control zonal output



ACCESSIBLE VALVES installed along the main steam distributing header are reached easily from the catwalk in the boiler house. Steam is used for heating and for laundry, kitchen, and bakery purposes



FEEDWATER TANK is drained by these piston pumps. Floatless liquid level control valves, operated by pressure differential, schedule intake

NERVE CENTER of the individual heat transmitting stations installed in major buildings is this single control panel which operates main lines

ating sufficient steam to fill all needs during periods of average draw. Even the demands of winter heating have seldom forced operating personnel to press more than an estimated "boiler and a half" into service. Individual panel boards enable a single technician to supervise and adjust the performance of these integral furnace-boilers from a central point for ultimate efficiency in the combustion process.

The oil storage and transmission systems for 120,000 gal of Bunker C residuum include four underground tanks and individual heaters of the steel shell and seamless copper tube type for heating 1440 gal per hr from 60 F to 100 F at 25 psi steam. Two oil pumps, running alternately, supply oil to the pumping sets.

Principal auxiliary equipment consists chiefly of a 100,000 lb per hr deaerating feedwater heater and boilerfeed pumps. Liquid levels at the boiler make-up tank, as are liquid levels in all storage tanks at domestic hot water distribution points, are regulated by floatless valves. Valves and pneumatic controls at numerous terminal points modulate the generation process or control zonal output.

Unit heaters and unit ventilators operated by motor driven fans, varying from fractional to multihorsepower, are in hospital areas which are not linked to the steam radiation system. Forced air heating of this type is installed in the inmates' kitchen and dining area, the employees' kitchen and dining area, and in the laundry. Separate fan systems are also installed in corridors in the male and female wings of the "cottages" and "disturbed" buildings, but here they merely supplement the regular steam radiation system. Twelve steam control zones in the "disturbed" buildings and four in the general "cottages" are engineered into the circuit to produce and maintain desired environmental conditions without tiresome and unreliable manual adjustment and readjustment.

Air Condition Surgical Suites

Year 'round air conditioning for the observation, operating, and plaster rooms assures not only stable and comfortable temperatures, but — most importantly — humidifies the operating areas to prevent static electricity from discharging and igniting fumes that are released during anesthesia.

Central station equipment is situated in a penthouse compartment above the surgical suites and can, when operating at full 25.9 ton capacity, meet the entire simultaneous load thrust upon it by rejecting over 373,000 Btu per hr. Individual temperature and humidity controls are provided for the plaster room, while the observation room is coupled to the operating room as one zone.

Equipment Is Tamperproof

Innumerable precautions prevent patients from tampering with exposed portions of heating conduit and radiators. All convectors are recessed and protected behind plated steel grilles, while radiator valves in patients' sections are of the lock-shield type and do not extend through radiator grille covers.

All protective screens and registers that could be accessible to inmates are attached with vandalproof screws of the spanner head type which require a special tool for removal. Exhaust air intakes are designed to prevent patients from maliciously jamming clothing or other foreign objects into them.

Steam is bled off the main line at initial high pressure for the completely selfsustaining laundry. With 133 psi steam to power the laundry service equipment, the facility absorbs the extraordinarily heavy demands which are normal to the hospital.

In all, over 3600 ft of pedestrian and utility subways joining the main buildings are lined with steam transmission lines, and over 1700 ft of steam conduit are strung through special tunnels.

Architects were Epple & Seaman and Leslie M. Dennis. The heating, piping, and air conditioning engineer was Herbert Fox. ⊣

Exhaust Hood Tests

. . . provide design data

Four types of exhaust hoods were studied and values of minimum velocity developed. Some conclusions reached were that. . .

. . . the entry coefficient values of 0.85 to 0.93 for canopy hoods and the push-pull system give satisfactory collection in the absence of cross drafts.

. . . with cross drafts over the push-pull system, the suction volume must be increased to maintain control.

. . . a double canopy hood with a center opening shows a uniform velocity across the hood face and a higher rim velocity for the same volume than does the plain canopy.

By Arnet B. Epple

Associate Professor
University of Michigan

TESTS to find values of minimum velocity for various exhaust hood types were held recently at the University of Michigan.

Hoods tested were the plain canopy, the double canopy, the flanged slot and push-pull types. These are illustrated in Figs. 1 through 4.

The procedure followed in testing was to adjust the air flow rate until all smoke released at the table level was removed. Then, the impact pressure at the measuring nozzle and the static suction one pipe diameter above the hood were read.

Readings were taken with a heated wire anemometer across the face of the canopy hoods and between the test table and hood. For the exhaust slots, air velocity readings were taken at the table top.

Solve for Plain Canopy Hoods

The air volume flowing into plain canopy hoods may be determined by choosing an average face velocity between 100 and 400 fpm, or by selecting a 50 to 500 fpm capture velocity and putting this value into the equation:

$$Q = 1.4\ PDV \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where Q = total air volume in cubic feet per minute, P = the perimeter of the hood in feet, D = the distance between the hood and tank in feet, and V = the capture velocity.

Selection of these factors depends on the cross drafts in the area, the toxicity of the smoke or vapor to be collected, and the extent to which the process may be enclosed. There are no definite rules — it is a matter of good judgment on the part of the engineer.

Choose Entry Coefficient

After determining the volume, the entry coefficient for the hood must be selected so that the suction at the duct connection to the hood can be derived. These values range from 0.85 to 0.93 for plain canopy hoods, depending upon the angle of the hood sides and the smoothness of construction.

The familiar relationship of air quantity, duct area and pressure drop, $Q = 4005\ AC_e\sqrt{P_s}$, may be solved for P_s thus:

$$P_s = (Q/4005\ AC_e)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where P_s = the duct area suction, in. of water gage, A = the area of the duct, sq ft, C_e = the entry coefficient for the hood — the ratio of actual velocity to theoretical — and 4005 is the constant when using 70 F air.

After adjusting the volume, the data in Table 1 was derived. Fig. 1 illustrates the lower volume flowing, as given in the table. The entry coefficient was computed from the static and velocity pressures in the duct. Thus,

$$C_e = \sqrt{P_v/P_s}$$

with P_v being the velocity pressure.

The static pressure in the duct was measured and the velocity pressure computed from the volume and duct size. Note the agreement of the two low volumes. This is unusual since the anemometer is hard to read that closely.

TABLE 1—MINIMUM VELOCITY VALUES that were derived for the plain canopy hood are as follows. The unusually close agreement of the two low volumes is accidental

Hood suction, in. WG	By nozzle, cfm	From avg. face velocity, cfm	Capture velocity, fpm	Cfm per sq. ft. of test table	Hood face velocity, fpm	Entry coefficient
0.3	2500	2580	32.5	1100	168	0.930
0.7	3560	4320	46.3	1580	284	0.865

Higher Rim Velocity Advantage

A higher rim velocity for the same air flow rate is the advantage of the double canopy hood. This is illustrated in Fig. 5. Actually, slightly more air is flowing into the double canopy, but were it the same, the advantage would be a little less marked.

In Fig. 2, smoke from the stick is seen being drawn into the slot. Smoke released directly under the hood would be drawn into the center opening by air flowing into the canopy.

1 PLAIN CANOPY HOOD exhausts smoke into its center orifice during tests to study the design factors of exhaust ventilation equipment

2 DOUBLE CANOPY HOOD exhausts through the center orifice and the rim slot, also. Note how the smoke is drawn into the slot from the stick held at the left

The object of this test was to find how the total air flow was divided between the hood perimeter slot and the center orifice and to find the entry coefficient for each opening.

This was done by closing the slot with masking tape and determining by the flow nozzles the air volume flowing through the several different diameter orifices for various duct static suctions.

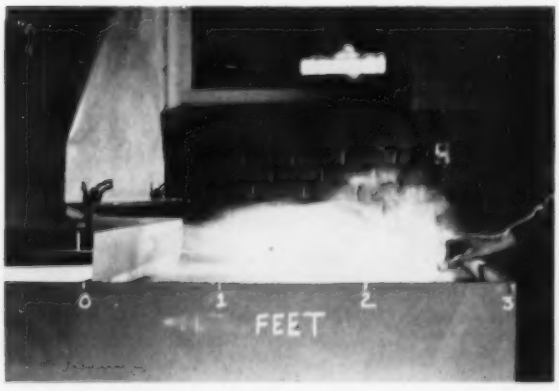
Then, the tape was removed from the slot and the orifice closed to determine the flow through the slot for the same duct suctions.

Finally, both slot and orifice were opened and the flow through each was found for tested duct suction pressures. Static suctions of 1.0 and 1.34 in. WG were used. At both suctions, the volume for the combined opening was 30 percent less than the sum of the volumes from indivdual tests. The reason for difference was probably the change in flow pattern when air was flowing into both openings at once.

Therefore, it seemed logical that the entry coefficient from individual tests should be reduced 30 percent for design purposes. The slot ratio of 0.73 was reduced to 0.51 and the orifice ratio of 0.94 to 0.66.

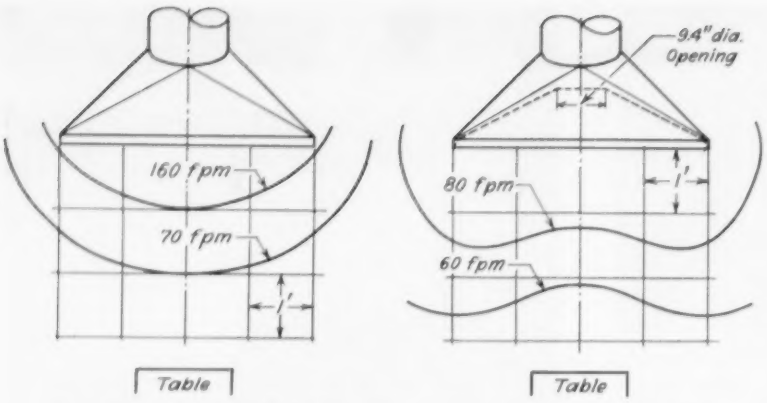
In the test of the slot and orifice separately, 60 percent of the total air went through the slot and 40 percent through the orifice for duct suctions of 1.0 and 1.34 in. WG.

In designing a double canopy, the total volume may be determined as if it were a simple canopy, except that the constants must be reduced slightly for the expected service. The following sample problem shows how to determine these factors.



3 SLOT EXHAUST proved effective on a table 3 ft wide. When the table was widened to 5 ft, the smoke was no longer under control and much escaped

4 PUSH-PULL EXHAUST has an exhaust slot supplemented by a blowing slot which literally pushes smoke into the exhaust. This is a modification of the slot type



5 VELOCITY CONTOURS for plain canopy and double canopy hoods are compared here. Note the higher rim velocity for the double canopy type for the same air flow rate

Problem: Find the total air flow rate, duct suction and diameter of connecting duct for a 47 × 47 in. double canopy where a 220 fpm face is deemed sufficient.

Solution: The total volume is

$$(47 \times 47)/144 \times 220 = 3380 \text{ cfm.}$$

The volume flowing through the slot is

$$3380 \times 0.6 = 2030 \text{ cfm.}$$

The volume through the orifice is

$$3380 \times 0.40 = 1350 \text{ cfm.}$$

An average velocity of about 2000 fpm has been found to be satisfactory for exhaust slots. Using this value, a ¾ in. perimeter slot with an area of 0.98 sq ft is selected.

The velocity at the slot center, using an entry coefficient value of 0.51, is then

$$2030/(0.98 \times 0.51) = 4050 \text{ fpm.}$$

The static suction above the slot must be equal to the pressure due to this velocity of 1.05 in. WG. Assume the suction to be transmitted to the slot without loss, so the suction above the orifice must be 1.05 in. WG.

The problem is now to find a diameter of opening that will accommodate 1350 cfm with an entry coefficient value of 0.66.

The area of opening is

$$1350/(4100 \times 0.66) = 0.50 \text{ sq ft.}$$

The diameter of this area is 9.57 or, say, 9.5 in. This is the diameter of the hole at the top of the inner canopy. A duct velocity of 2500 to 3000 fpm is desirable, so a 15 in. duct giving 2750 fpm is selected.

Tests carried on thus far on the high velocity slot exhaust show good results on tables up to 2 ft long. Since a slight side draft might sweep the smoke off longer tables, slots should be used on both sides or a blowing slot added.

Fig. 3 shows the slot withdrawing around 2400 cfm, or 268 cfm per sq ft for a 3 ft table. The table was lengthened to 5 ft, thus reducing the cfm per sq ft to 160.

The usual range is 150 to 250 cfm per sq ft, and this is a good key to determining the volume—considering the entry coefficient of the slot to be around 0.60.

Add Blower Slot for Push-Pull

Since it is impractical to draw air into a slot exhaust from a distance greater than 2 or 3 ft, a blower slot may be added directly opposite that literally pushes the air into the exhaust slot. Fig. 4 shows this arrangement exhausting over a table 7 ft long.

For this system the air volume to be exhausted is determined by allowing 100 to 150 cfm per sq ft of table, depending on cross drafts. The opening should be the width of the table and the height equal to the arc subtended by a 10 deg angle with apex at the pressure slot.

The blow volume is calculated from the exhaust volume by the equation:

$$Q_1 = [1/(L \times E)]Q_2 \quad \ldots\ldots\ldots (3)$$

where Q_1 = the blow volume in cubic feet per minute, Q_2 = the suction volume in cubic feet per minute, L = the length of the table, and E = the entrainment factor of 2 for a 7 ft table.

This system was tested to measure supply and exhaust air volumes when good collection had been attained with and without cross drafts, and to study the effect of volume changes on the system's effectiveness.

As with the double canopy hood, the entry coefficient can be calculated from the relation:

$$C_e = \sqrt{P_v/P_s}$$

where P_v is derived from the volume and P_s will be measured.

To measure the volume of air supplied the blow slot, the nozzle and impact tube were attached to the inlet of the blow fan. The entry coefficient values for the blow slot were determined from this volume and the static pressure was read on an inclined manometer to the right of the plenum.

The suction nozzle interfered with the movement of the table to shorten the length of draw, so curves were drawn to give the volume flowing for a range of plenum pressures. The nozzle was then removed and the plenum pressure was varied by sliding the gates on the fan outlet.

Table 2 shows the entry coefficient values for both openings. The values are average for the range of pressures and slot widths given.

Fig. 4 shows conditions with total air flow of 2450 cfm, or 117 cfm per sq ft being removed. For this volume, 176 cfm should be supplied. Actually, 115 cfm is being supplied through a ¼ in. slot at an average velocity of 2470 fpm. This was found to be more effective than 196 cfm

TABLE 2—ENTRY COEFFICIENT values for the push-pull system and the blow slot are compared. The values are average for the range of pressures and slot widths indicated.

Push-pull system

Slot width, in.	Hood static suction, in., WG	Entry coefficient
1 — 2½	1.0	0.90
3 — 5	1.0	0.75

Blow slot

Slot width, in.	Hood static suction, in., WG	Entry coefficient
¼ — ½	0.2 — 0.7	0.90
¾	0.1 — 0.4	0.84
1	0.1 — 0.3	0.78

supplied from a ½ in. slot at 1570 fpm.

During the test a 50 fpm cross draft was caused to strike the table at its midpoint. The suction volume had to be increased to 3620 cfm (172 cfm per sq ft, whereas 150 is the maximum suggested). The blow was increased to 235 cfm against a calculated value of 258 cfm. A ½ in. blow slot with a 1940 fpm average velocity was the most effective.

The tests provided some findings even beyond the velocity data. In one series, 9 in. on each side of the blow slot was closed off. This cut down the tendency for air to blow past the side of the suction hood, thereby making possible a reduction in suction volume.

The baffle board as shown in Fig. 4 slightly decreases the amount of suction needed by concentrating the air flow into the vertical side 1 in. slots and the horizontal slots.

Keep Exhaust, Supply Air Equal

Important to remember when installing a push-pull system is that provision must be made for adjusting the supply and exhaust air.

If too much air is supplied from the blow slot, air or smoke is blown past the sides of the suction hood. If too little is supplied, the suction must be maintained at a higher rate than should be necessary.

Several attempts were made to cut down the volumes when the table length was shortened from 7 to 5 ft. None was successful. This could mean that the exhaust is not affected by table length. More tests will have to be made before this can be stated as being definite.

The fact that air cannot be drawn more than about 3 ft would support the constant exhaust volume concept. However, cross drafts cannot be controlled by increasing only the blower volume. ⫩

Data Derived From Laboratory System

The laboratory was composed of a centrifugal dust collector, an electrostatic air filter and four exhaust hoods connected to a trunk duct leading to a single paddle wheel type exhaust fan. The air flow rate from any of the hoods or to the collectors was regulated by blast dampers in each branch line.

On the discharge side of the fan the duct expanded to a chamber 5 ft wide and 2 ft, 6 in. high, which houses three flow nozzles having 8, 9 and 10 in. diameters. Three size nozzles were installed so that velocities of 2500 fpm or above could be obtained.

Calibration of the meters was accomplished with a small pressure blower discharging into a 3 in. duct. A pitot tube measured the velocity pressure. The air flowed from the 3 in. duct into an expansion piece which increased the diameter to 20 in. Several thicknesses of air filter paper were in the air stream to further even out the air flow pattern across the 20 in sections.

The volume of air flowing in the 3 in. duct at high velocity was determined by the pitot tube, and the velocity in the 20 in. duct was calculated from the ratio of areas. The probes of the air velocity meters were then held at the opening of the 20 in. duct. From their reading and the known calculated velocity, a correction factor was obtained.

Ice Storage Air Conditioning

. . . . does good job in churches and motels

CHURCHES AND MOTELS are particularly good applications for ice storage air conditioning systems, said A. P. Boehmer, chief engineer of the Dole Refrigerating Co., in his recent talk at the Chicago section of the American Society of Refrigerating Engineers. With this system, ice is accumulated over periods of no or low cooling load to handle peak load periods.

An important consideration on some jobs is that ice accumulation permits use of an air cooled condenser, as the compressor is much smaller than would otherwise be required, he said.

With the storage system, a 50 ton peak load for a period of two or three hours on a Sunday can be handled by a 10, 7½, or perhaps a 5 hp refrigeration machine, he said. This of course cuts the demand charge for power. He cited an example of an $85.50 per month demand charge for a 50 hp compressor in one city, which would be only $9.50 for a 10 hp unit. A large church in Dallas is saving some $2000 a year in demand charges alone by use of a storage system, he said.

The ice accumulator units are usually installed outside the church, the chilled water being pumped to the various zones of the air conditioning system, Mr. Boehmer said. In answer to a question, he stated that the loss from the ice tank — not including losses from the piping and those due to pumping — is less than 1 percent, as the tanks are usually painted with aluminum to reduce sun heat gain and are insulated with 3 in. of glass wool. The accumulator tanks can also be buried underground, which reduces heat gain.

Electronic control of the ice thickness accumulated on the plates of the storage unit is "very satisfactory," he stated; it is based on the difference in electrical conductivity of water and ice. However, where the mineral content of the water is high, such control can't differentiate between water and ice.

Design of an installation is usually based on an 8 F rise of water temperature through the air cooling coils, from which can be figured — the air conditioning load being known — the gpm of water to circulate and thus the motor horsepower for pumping the water, he stated. ⫩

Case Histories from a Consulting Engineer's Files

Correct Faulty Refrigerant Piping

By C. T. Baker
Consulting Engineer

Faulty refrigerant piping systems can be corrected to achieve efficient, economical operation. Three common faults described here are liquid flooded cooling coils, oil clogged evaporator coils, and compressor shutdown due to high condensing pressures. Correction in each respective case was made by rewiring the control, installing oil drain valves, and providing adequate ventilation.

CASE No. 1

AN AMMONIA refrigerating plant serves a combination cold storage and banana curing plant. Fruits and vegetables are stored in three of the rooms and bananas ripen in three other rooms under refrigeration.

Floor mounted cooling units are in the banana rooms and ceiling type units are in the regular cold storage rooms. During summer months, one of the two compressors serves the storage rooms and the other serves the banana rooms and offices. The plant is automatic.

Control wiring was installed so that as the temperature of each room was lowered to the predetermined point, the thermostat closed the solenoid valve on that room, and so on, until each room was satisfied. When all three of the fruit and vegetable rooms had reached the required point, the solenoid valve on the last room to be satisfied would close and also stop the compressor. Later, the first room to call for refrigeration would start the compressor again and open the cooling coil solenoid valve. The same system controlled the operation of the banana rooms.

Frequently, particularly during light loads, two of the cold storage rooms would reach the cut-out point at about the same time, leaving only the cooling coil in one room to provide the load for the compressor. This often resulted in lowering the suction pressure to the point where the low pressure cut-out would stop the compressor before temperature had dropped to the point where the thermostat would stop the compressor and close the solenoid valve on the liquid supply to the cooling coil.

With the solenoid valve in the "open" position, there was nothing to stop the coil from filling and overflowing into the suction line if the compressor were off the line for any length of time. This caused a loud pounding of the compressor which persisted until the coil was freed of liquid.

The control wiring was rearranged so as to close the solenoid valve on the coil liquid line with the stopping of the compressor, either by the temperature controlled thermostat or by the low pressure cut-out.

CASE No. 2

A SMALL meat packing plant has two self-contained ammonia refrigerating machines, one to handle the low temperature cooling load and the other to refrigerate the higher temperature rooms.

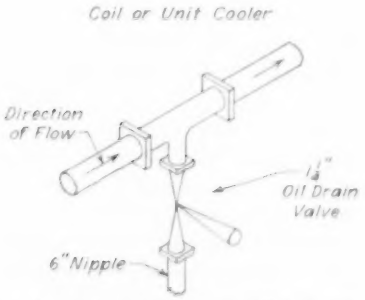
The two-cylinder units, each 5 by 5 in. bore and stroke, operated at 225 rpm. Bearings and cylinder walls were lubricated by splash feed from

the machine crank case. I was engaged to determine why the compressors failed to maintain the required temperatures in the refrigerated rooms.

When the refrigerating plant and boiler plant equipment was purchased, several years prior to my investigation, the deciding factor had been price. Apparently no thought was given to operating cost. This mistake came to light when the property was purchased by others.

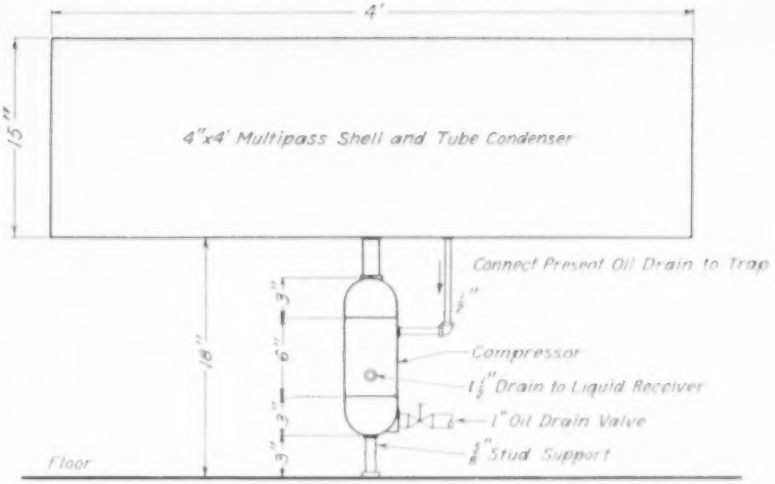
The sales engineer who sold the refrigerating equipment to the original owners failed to include in his proposal a liquid receiver for draining the condensers; the 15 in. diameter, 4 ft long multipass ammonia condensers acted as both condenser and receiver. Of course, since no receiver had been included, the purchase price was less.

A further saving in first cost was realized by providing no means for draining oil accumulations from the room cooling coils and the suspended type unit coolers. To rid these evaporators of several years' accumulation of lubricating oil, it was necessary to pump them out one at a time and then install an oil drain in each. When the evaporators were opened, many gallons of oil drained out. The drain valves were installed at the low point in the coils and unit coolers. See Fig. 1.



Oil drain valve was installed at low point in each coil and unit cooler to prevent oil accumulation.

1 DRAIN VALVES AND CONNECTIONS were arranged as shown here to draw oil from coils and 2-cylinder suspension type ammonia refrigerating units. Later an oil purifier was installed. Original installation had provided no means for draining oil from coils and no liquid receiver for draining condensers



2 CONDENSERS ABOVE COMPRESSORS were installed in a way that prevented the use of a high pressure oil trap in the discharge pipe. So small oil traps were installed beneath compressors, with oil drain valves connected to an oil purifier. Liquid ammonia outlets were also provided and connected to a liquid receiver

To prevent the drains from too easily becoming plugged with scale and dirt, 1 1/4 in. valves were used. Later, an oil purifier, to which all drains were connected, was installed. This not only accomplished the recovery of oil from the evaporators, but eliminated the loss of ammonia and the danger of injury to those who were required to manually drain oil from the evaporators into a receptacle.

The condensers were installed above the compressors in such a position as to prevent the use of a high pressure oil trap in the discharge pipe between the compressor and the condenser. However, 18 in. of head room between the bottom of the condenser shell and the concrete floor permitted the installation of a small oil trap. See Fig. 2. Liquid ammonia drained from the bottom of the condenser shell directly into the oil and liquid separating trap. The original 1/2 in. oil drain was also connected to the trap, as shown.

A 1 1/2 in. liquid outlet opening was provided at the midpoint of the trap and was piped to a liquid receiver, 12 in. in diam. by 6 ft long. A 1 in. oil drain valve at the bottom of the trap was later connected to the oil purifier.

Together, the oil drains on the evaporators and the oil traps beneath the condensers have ended the oil accumulation trouble.

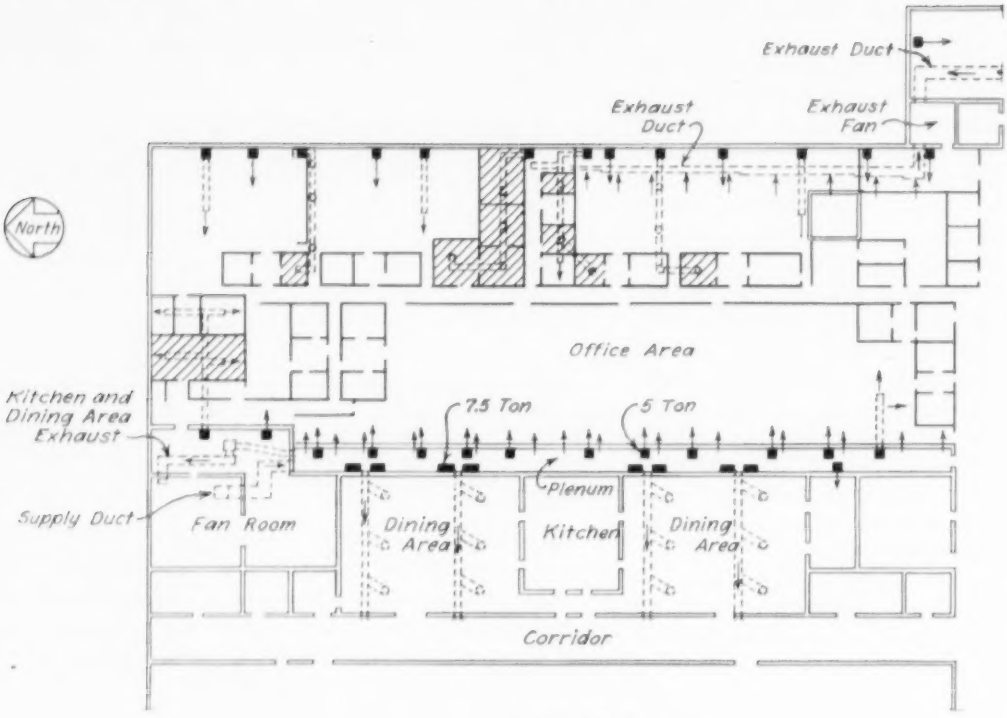
CASE No. 3

A CERTAIN dairy plant had two compressors, one evaporative condenser, a brine tank, and the usual auxiliary equipment. The evaporative condenser and the two compressors were housed in a room approximately 10 by 12 by 8 ft floor to ceiling height.

Air supply to the condenser entered near the bottom of the unit and was discharged horizontally near the top. Other than through doors opening into other parts of the building, no means was provided for expelling the warm, humid air from the room. At night the doors were closed, which meant that except for a partially opened window near the compressors, there was very little change of air in the machinery room.

This situation caused high condensing pressures and frequent shutting down of the compressors by the high pressure cut-out. It was corrected by relocating the condenser and by providing an air inlet and a discharge outlet to carry the discharge air and water vapors to the outside of the machinery room. ✠

Air Condition Jet Design Offices with



North Office Area

1 NORTH OFFICE AREA air conditioning load of 140 tons is handled by 5 ton units. Kitchen and dining areas, with a load which totals 65 tons, are served by 7½ ton units

By James A. Lamb

Supervising Engineer, Facilities
Evendale Plant
General Electric Co.

• 100,000 sq ft of basement office space in this windowless building is air conditioned by 5 and 7½ ton package units. Some of the units are installed in two 14½ ft high walk-through plenums, and others are installed along walls, while others are out in the middle of a large area. Existing supply and return ducts were utilized.

Cost, flexibility, and ease of installation are the factors behind GE's choice of a 400 ton package system to air condition engineering offices in its jet engine plant at Evendale, Ohio, near Cincinnati.

We were particularly interested in causing as little interference with the work of the occupants as possible during installation. In discussing both central plant and package systems, it was decided that installation of water piping for package units would probably cause less interference than an extensive overhead duct system.

Furthermore, the system had to be flexible. With package units, more control points were obtained, which aided considerably in solving the balancing problem. And, should the load concentration change, the water piping will be easy to rearrange.

As to cost, a central system was estimated as follows:

Ductwork and condenser water piping	$122,450
Refrigeration system	61,300
Controls	10,000
Electrical connections	9,000
Cooling towers	23,000
	$225,700

Cost of the package system was estimated as follows:

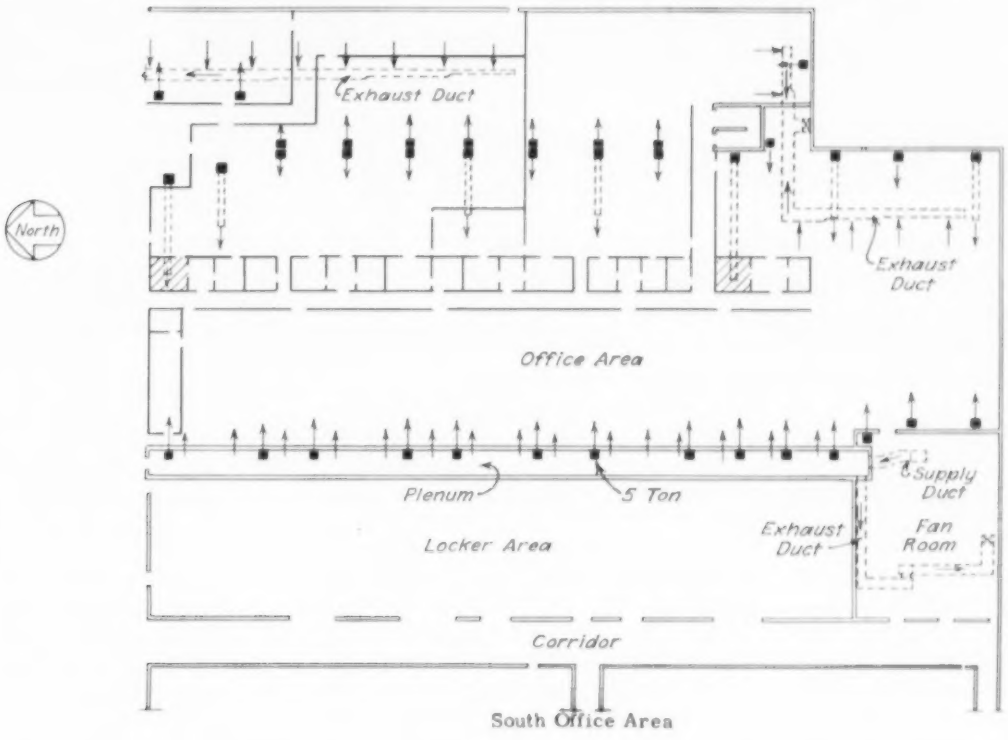
Ductwork and condenser water piping	$ 82,700
Refrigeration system (units & setting)	77,100
Controls	1,000
Electrical connections	21,700
Cooling towers	23,000
	$205,500

Since the actual cost of the package system was $203,177, $22,500 was saved in first cost over a central plant system.

Of the total engineering office space, about 91,000 sq ft is office area and 9000 sq ft is drafting area. With about 1400 people in 100,000 sq ft, this averages 71½ sq ft per person, which is fairly crowded in an office of this type.

In the general office space, 7½ ft partitions provide offices for supervision. Some of these offices have ceilings, but most are uncovered. The covered offices are shown cross-hatched in Figs. 1 and 2. The 7½ ft partitions are open at top and bottom to permit circulation of air. The capped offices — 12 of them — were

400 Ton Multiple Package System



2 SOUTH OFFICE AREA installation consists of 5 ton units in the plenum and in the middle of the office space. Small sections of ductwork enable 10 units to throw cool air over partitions and drop it into enclosed offices

treated as individual control points.

In the past it has been advantageous to shift groups of engineers and draftsmen around as work assignments and personnel requirements on various projects changed. The rearrangement of the office force presents no air conditioning problem except as the drafting area is moved. With its higher lighting load, required cooling capacity would have to be shifted.

The location of the package units is shown in Figs. 1 and 2. Five ton units are used except in the cafeteria, where 7½ ton units are used.

In the cafeteria the existing ductwork and diffusers were adequate, and the 7½ ton units were simply connected to these ducts in pairs in the plenum. Piping for these units was run in the plenum.

Outdoor air is taken into these units from the plenum, and the rest of the air is recirculated. Exhaust air is taken out through the kitchen and toilet exhausts. Room air temperatures are controlled by return air thermostats in each of the units which start and stop the condensing units.

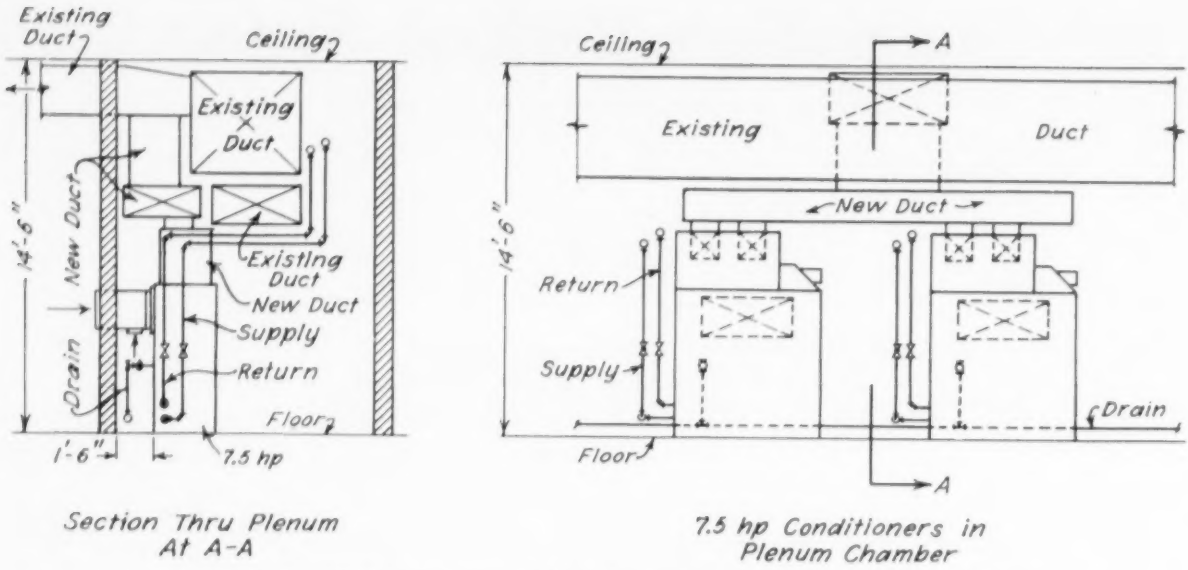
In the north and south office areas, some of the units are in the plenums, and some are out in the office space. The plenums are 14½ ft high. The units in the plenum were installed with little interference with the office force. The disruption of the office during installation of the other units was noticeable because of the crowded conditions.

The ceiling height in the office area is also 14½ ft. Air throw required to reach the main north-south corridor is 60 ft. In placing these units, the throw into the corridor was not considered to be critical. In most areas — particularly the open areas — the air distribution from the units has been adequate. However, it has been necessary to add small sections of ductwork to 10 of the units.

After the decision had been made to use the package units, additional offices with 7½ ft partitions were added along the north-south corridor about 42 ft from the units. This already difficult air throw was further complicated by a 16 in. sewer line about 1 ft below the ceiling. Under these conditions, the units were unable to throw the cool air far enough to clear the 7½ ft partition and drop it into the enclosed office area. Duct extensions with outlets in the ends achieved satisfactory results.

The offices which were completely capped presented a special control problem because a variable air change and cooling capacity was desired to handle heavier cooling loads during conferences. This was done by installing motorized dampers in the supply ducts to these offices and controlling the dampers from a room thermostat in the office.

The dampers have minimum and maximum settings. The settings are in parallel with the thermostat on the package unit, so that any of these offices can override the unit thermostat and call for continued cooling.



3 PLENUM CHAMBERS house many of the package units, condenser water piping, and drains

Two 5 ton units serve each capped office and enough additional open space to make up a 5 ton load. All areas are controlled satisfactorily.

The condenser water piping and drains run through the air plenums to those units in the plenums and along the walls to the others, except for 14 units in the south half. Because of the shape of the south half, these units had to be in the middle of the office space. The condenser water piping runs overhead to these units. The drains are in the floor for about 19 ft to an existing drain line. By placing these units in pairs, back-to-back, the condenser water piping is simplified, and one drain serves two units.

Utilize Old Ventilating System

The space is in the basement of a windowless building and was originally used as a machine shop and storage area. Of course, the ventilation requirements were different from those for an office area. The ventilation system consists of north and south supply plenums on one side of the area and three large exhaust fans on the other. The supply plenums are also shown in Figs. 1 and 2.

The ventilation air change rate of six per hour proved to be inadequate for this office space without windows. In addition, the distribution was not satisfactory.

Much of the service piping for the building had been hung from the basement ceiling. This piping, along with conduits and lighting, provided ceiling interference which would have complicated the installation of additional ductwork.

The ventilation system for the cafeteria was separate from the north plenum supply, having its own 34,000 cfm supply fan and its own exhaust system.

Separate supply and exhaust air ducts for the locker areas were in the south half of the building. Though these ducts were in the main plenum, the ventilation system for the locker area was separate from the main office area.

System Saves Space

At first, it was felt that with the package unit system the loss of floor space could not be tolerated. However, careful consideration proved this to be in error. A unit was tested and it was found that office desks could be within 1 ft of the unit. Since installation, some office equipment has been set next to the units, so an average of only 14 sq ft of floor space per unit is required. For the 39 units installed in the office space, 546 sq ft of floor space is required. However, by removal of the north and south exhaust fans — only the central exhaust fan is required to provide the necessary air changes — an additional 648 sq ft became available. Therefore, the system provides a net gain of 102 sq ft of office area.

When it later became evident that better air distribution of the exhaust in the south area was needed, another small exhaust fan was added. Installed on top of a toilet area on the first floor, it discharges into the existing air shaft. The cost of this fan and ductwork is included in the cost figures for the package unit system.

Clean Filters in 9 Man Days

In comparing the central system with the package unit system, it was felt that maintenance would be higher on the package units largely because of the time to clean the air filters. A lot of filter cleaning would be needed to justify an additional $21,000. So a regular schedule for cleaning filters, using equipment already acquired for cleaning kitchen filters and room unit filters, was set up. Experience has shown that it takes about nine man days per month to clean the air filters in all the package units. ∓

Question of the Month

How Can I Heat Monitor Building?

A high volume of air circulated at not too high a temperature will achieve good heat distribution, say two readers. They discuss arrangement and operation of unit heaters of the steam and warm air types. A third recommends the use of infra-red ray radiant heaters, especially where convection losses are great.

THE QUESTION, *What's the Best Way to Heat a Monitor Top Building?*, was published previously in HPAC and is repeated here with three answers that have been received. Other comments for publication will also be welcome.

"I would like some help on how to find the best way to successfully heat a monitor top building where a number of workers are on the ground floor.

"We found that a duct from one heater unit delivering warm air to the floor minimized drafts and the cold air near the floor, but temperature distribution was not uniform. A blower in the unit heater without a duct forced the warm air down but didn't draw the cool air out of the lower level in the working area.

"We have some unit heaters at the 8 ft level which discharge warm air horizontally over working areas, but there are objections from the workers that the air is sometimes too warm. Also, the warm air rises into the monitor, leaving the cool air near the floor"—W. H. H.

D. C. SINCLAIR —

"Infra-Red Ray Heaters Heat Floor, Avoid Loss"

THE BASIC PROBLEM of heating a monitor top building is to produce a comfort zone in working areas, while at the same time minimizing heat losses through the monitor.

Heating by convection is often satisfactory. However, where unsuccessful, it is due to drafts, entrainment of cold air, heated air rising out of the comfort zone, or body radiation to cold objects near personnel.

One method of heating that does not produce the foregoing objections is infra-red radiant heat. Infra-red rays of lengths that effectively penetrate comfortable heat pass directly through space without loss of energy or entrainment of cold air. The radiant rays heat personnel, machinery, and floor so that the personnel are in a zone of comfort. Since heat from a suspended radiant heater is directed downward by infra-red rays, heat loss through walls and ceilings may be reduced as much as 50 percent. In this manner, heating costs are greatly reduced.

The radiant heater is usually installed at heights varying from 8 to 16 ft above the floor. The number of heaters required depends on design temperature, installed height, and size of area to be heated. In a monitor type building, it may be installed on an area basis. It is not necessary to satisfy the conventional heat loss figures. Tables have been devised for placement of the heaters according to the aforementioned conditions.

One type of infra-red radiant heater is manufactured in two sizes of 62,500 Btu and 125,000 Btu input, with thermostatic control. It is suitable for burning any type of gas. No wiring is necessary as the controls are self-energized. It is only necessary to suspend pipe to the gas source and vent the panel. Since the panel does not have moving parts, maintenance is negligible.—D. C. SINCLAIR, Engineer, Thermobloc Div., Prat-Daniel Corp.

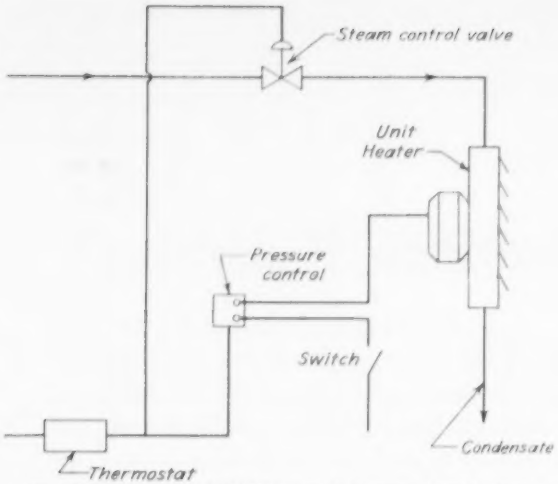
H. B. WAYNE —

"Blast Air from Unit Heaters to Work Zones"

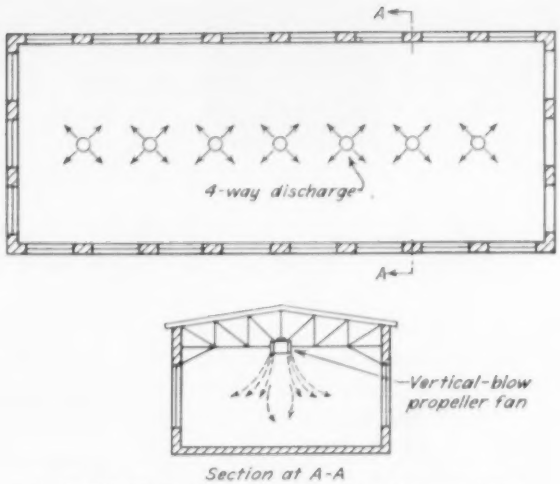
IN ORDER TO deliver air to the required location and diffuse the air to avoid drafts, unit heaters are frequently furnished with directional outlets, adjustable louvers, or fixed type diffusers. Preferred arrangement has the heaters discharge the air nearly parallel to the building walls and in a direction which will produce a rotational circulation around the room.

Suspended heaters should be installed 12 to 15 ft above the floor and the blast should be directed downward as well as horizontally. The higher a unit heater is located above the floor, the lower must be the leaving air outlet temperature in order that the heated air is focused into the occupied zone. By installing the heaters at a high elevation, air is drawn from the upper levels of the heated space, is projected downward, and tends to break up stratification that sometimes exists where high ceilings allow heated air to gather in layers above the working level. Circulation of large air volumes at relatively high velocity and low temperature will reduce the tendency for stratification and give more uniform temperature distribution.

When selecting unit heaters, it is important to determine if the blast is adequate. Blast is dependent upon the air temperature leaving the heater



1 STEAM UNIT HEATER, with blower, should have a thermostatic device to prevent the fan from running if steam is not available



2 FOUR-WAY DISCHARGE, vertical-blow, propeller-fan unit heaters arranged along the center of a monitor type building should give uniform distribution

as well as on air velocity. The following table lists recommended air velocity and available distance air will blow for different fan types.

Type of Fan	Outlet Velocity, ft per min	Distance of Blow, ft
Centrifugal	1500 to 2000	20 to 200
Horizontal propeller	400 to 1000	30 to 100
Vertical propeller	1200 to 2200	70

W. H. H. does not indicate the source of heat (steam, hot water, gas, electricity). If steam is employed, the blower should be started and stopped while steam is passing through the heater. An arrangement of a unit heater, blower, and temperature control for a steam unit heater is shown in Fig. 1. With automatic control, a thermostatic device should be installed to prevent the fan from operating if steam is not available. This is very important if the heater passes part or all outside air that may at times be below freezing temperature. For an industrial building of the type described by W. H. H., vertical-blow, propeller-fan unit heaters, with four-way discharge outlets for uniform distribution, may be arranged as shown in Fig. 2.

Several rules should be observed when engineering a unit heater system. Exposed surfaces should be effectively blanketed with warm air to prevent cold areas along the exposure. The blast from the heaters should wipe the exposed surface at a moderate angle. If conditions require the units blow directly toward exposed surfaces at right angles, it is necessary to have sufficient throw to reach the walls. The heaters should be kept far enough away from exposed surfaces to permit the velocity to dissipate. Low velocity air will mix very well with cold infiltering air and heat the area near the exposed surface with maximum effectiveness. If the building has a large heat loss through the room, some heaters should be directed away from the wall exposure to create minor air currents which will help combat roof losses.

Unit heaters should be located and directed to allow the air stream from one unit to support that of the next and allow maintenance of a general pattern of air movement. Suspended heaters having recirculating ducts will produce more uniform results, since they withdraw cold air near the floor line, which is constantly replaced with warm air from the upper levels.—H. B. WAYNE, Consulting Engineer. ∓

READER ASKS —

"Use Steam or Electrical Tracing for Pipe Lines?"

"We would like answers to these questions on heating pipe lines:

"1) What type of steam tracing arrangement has been most successful for outdoor pipe lines? (2) What are the advantages and disadvantages of spiral wrapped tubing vs. parallel tubing? (3) What is the most economical and satisfactory insulation method for steam traced lines, 1 to 6 in. in diameter? (4) What are the average installed costs of steam tracing and insulation on existing pipe lines? (5) What size of tracing and what materials are recommended for tracing lines? (6) How often must steam traps be placed on steam tracing lines; i.e. how many feet of tracing should be used before trapping out, for spiral or parallel tracing and for lines of various sizes and materials?

"7) What advantages and disadvantages have the various types of electrical tracing for outdoor pipe lines? (8) What are the average installed costs of electrical tracing and insulation on existing pipe lines, 1 to 6 in. in diameter? (9) Which system, steam or electrical, seems to be the best on a first cost basis, and on an overall basis?"—R.H.C.

• *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

E. K. CAMPBELL —

"High Volume of Air Does a Good Job"

I HAVE HANDLED a number of monitor type buildings, and our factory now is in a monitor type building 250 ft long. I have not found—if the heating plant is right in every other respect—that the monitor type building presents any particular problem. In this case, W.H.H. may not have handled sufficient air to get the job done.

The work to be done by W.H. H. can be done with steam coils just as well as with a warm air furnace, but these examples are all from experience with a warm air furnace.

If the air next to the floor is not heated by a direct means, this space must be heated by displacement, pulling the cold air off and replacing it by warm air from above, which must come down fast enough so that it reaches the place to be heated while still warm.

We found that a 10 minute air change—or 6 changes per hr—on the recirculation basis, with the air not too intensely heated, will do a good job under most conditions. We have found some buildings, particularly one story schools with uninsulated ceilings, where the air movement must be higher than that. The amount of heat required is so great that more air must be handled to prevent overheating, which tends to defeat proper distribution.

The old part of our factory is a one story monitor type building, 60 ft wide by 250 ft long. A clerestory runs the full length of the building with the exception of the end bay at the north end. At the south end, the old building joins the new high ceiling building which we have erected to accommodate overhead cranes.

The heating of our entire factory building, with its monitor type section, is accomplished by a furnace fan system, with one discharge into the high section and a single heat discharge up high for the monitor section. Both openings are about 18 ft above the floor and at the nearest point to the furnace. The opening to heat the clerestory section is at the extreme south end, blowing toward the north. The main entrance of the building was originally at the north end and was exposed to north winds. The office was upstairs over the north bay, and there was nothing between the outside entrance door in the center of the north end and the heat outlet.

The return air for the entire building is all pulled to one spot and makes an objectionable draft where it concentrates to enter the fan chamber. That is not objectionable in our case, as no one works in that space regularly. With the volume of air handled in proper amount, there has been no difficulty in driving the heat to the north end of the building. We have had no difficulty in keeping that part of the building warm down to the floor under all sorts of weather conditions.

The monitor has a great deal of glass along both sides, and there's glass along both sides of the building underneath the side roofs.

We have since cut off the three north bays of the building and made that into office space. The north entrance has been closed and is now a window. The main entrance is now on the west side of the building. But even with the main entrance on the north, we had no trouble heating that monitor section.

We provided a furnace of sufficient capacity—limit rating 8 million Btu—duct and discharge of sufficient capacity to move the necessary air in, and access to the fan room of sufficient size to pull the cold air off the floor.

Where there's nothing to interfere with the proper circulation within the room, the warm air is going to float across the room in an even layer because it's a layer of even weight. It's the lightest air in the room and it's going to stay at the top. As it cools down and more heated air comes in, the new heated air takes the top position and the other strata of air works down, losing a little heat as it goes.

With the cold air pulled off the floor, the warm air falls down from above, and the success of the process depends on its speed. If the warm air moves down to the floor before it becomes cool, the heating plant is successful. If the air doesn't get down that fast, the situation at the floor might be just about as bad as if there were no heat in the building.

Now, one practical suggestion for Mr. W. H. H. If you take any kind of fan and place it so that it can direct its discharge vertically upward, and run the fan fast enough so that it gives that discharge air a good velocity as it goes upward, that will pull the cold air off the floor and drive it up into the layers of warm air, where it will mix. It will increase the recirculation that is already there and have the tendency to equalize the temperatures up and down and correct your troubles without much expense. It goes without saying that such a fan must be of sufficient capacity to move all that cold air off the floor and drive it into the upper levels. Not knowing anything about the size of the room or much else about it, I'm not able to suggest a size for the fan.—E. K. CAMPBELL, President, E. K. Campbell Co.

$3/4 Million Program To Air Condition L.S.U.

. . . approved by state authority

A $720,000 air conditioning program on the Louisiana state university campus has been approved by the Louisiana state building authority.

L.S.U. Comptroller Daniel Borth told the authority that the project, calling for building a central unit with a view toward eventual air conditioning of the entire campus and immediate air conditioning of several buildings, was "justified on the basis of present space that will be made usable."

Pointing out that many university research projects required air conditioning, he said that "small units are more costly when compared to a central system, taking into account all the factors."

Rep. Bryan Lehmann, chairman of the appropriations committee of the Louisiana house of representatives, said he thought the action was justified and that eventually all schools would be air conditioned. ✣

On the Job —notes from the field

Hot Water Convectors Heat Quality Motel

. . . steady warmth draws patrons

To cope with an occasional temperature differential of 100 F between indoors and outdoors, a forced circulation hot water system was installed in the 20 room College motel, Houghton, Mich., according to the National-U. S. Radiator Corp. The heating system is credited with drawing hundreds of winter tourists and business patrons who have heard about its reputation for constant comfort.

An oil fired steel boiler, installed in the basement of the owner's central residence, burns No. 2 fuel oil. It has an SBI net rating of 3240 sq ft water, or 486,000 Btu per hr.

Heat distribution is through 59 convectors. One convector is under a window of every motel bedroom and of each lavatory. There are two convectors in each of the two corner motel units to compensate for heavier loss due to three exposed sides.

Every motel unit has a room thermostat, plus a motorized valve for the convectors. Control wiring goes to three pumps at the boiler. The two motel wings and the central residence each comprise a separate zone. Insulation curbs heat loss.

The heating contractor was Jack Bianco and Sons. ≠

Air Conditioning Cuts Chick Hatchery Loss

. . . low velocity diffusers used

More baby chicks now live to become big chicks as a result of air conditioning New Jersey's largest hatchery, Melini's Vineland Farms Hatchery. Between 10 and 12 million chicks are hatched each year. Air conditioning of the hatchery's most vital area was completed in spring 1955, according to the Airtemp Div. of Chrysler Corp. This is the holding room, where chicks are kept before shipment.

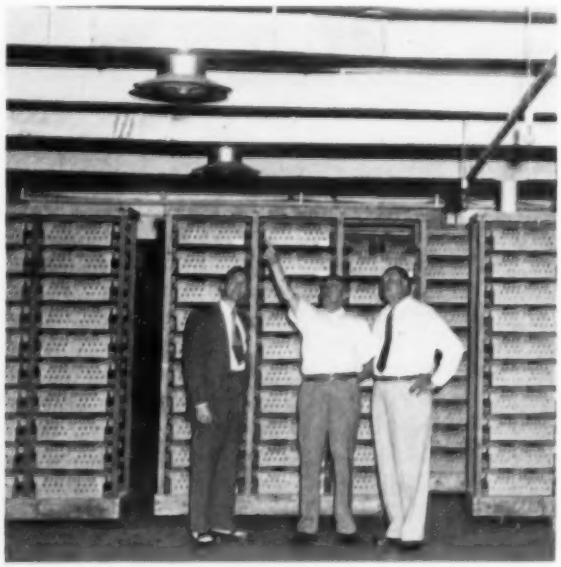
Previously, hot summer weather always produced a sharp rise in chick mortality, both at the hatchery and in transit. Numerous complaints were received. Although summer 1955 was one of the hottest in many years, the hatchery did not receive a single customer complaint stemming from excessive chick loss.

A 15 ton package unit maintains a room temperature of 73 to 74 F. Previous summer room temperatures reached 95 F and above.

Low velocity air diffusers solved the problem of how to put conditioned air in on the chicks without creating a draft, which would have caused a great loss. Air discharge velocity is 500 fpm, with a maximum 50 fpm 18 in. directly below the diffusers. Chicks can now be stacked in cartons within 18 in. of the diffusers.

A steam coil in the package air conditioner also provides for the tempering of outside air in the winter.

HOT WATER CONVECTOR SYSTEM provides winter warmth in consistent 70's for motel on Michigan's northwest peninsula. Room thermostat, plus motorized valve for convector, allows guests individual heat control



AIR CONDITIONED STORAGE ROOM at large hatchery is served year 'round by 15 ton package unit. Cartons can be stacked twice as high as before

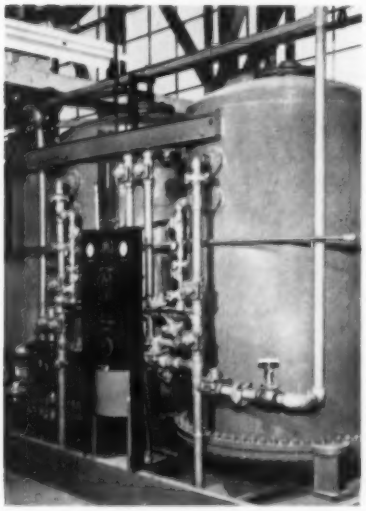
Outside air in winter must be circulated in the holding room to maintain the right amount of oxygen at all times.

The problem of chicken fuzz was overcome through the use of a double bank of filters, which are cleaned daily to prevent any variation of unit efficiency.

The system was designed by S. S. Fretz, Inc., and installed by the Cheli Coal Co. ⫩

Plastic Piping Used For Deionized Water

. . . at room temperature and 300 psi



POLYVINYL CHLORIDE piping that serves the deionizers at Appliance Park was fabricated with injected molded PVC fittings and flanges

POLYVINYL CHLORIDE piping has been installed at General Electric Co.'s Appliance Park, Louisville, Ky., to carry deionized water at room temperature and with a 300 psi total head, according to Tube Turns Plastics, Inc. Main lines are 2 in. and laterals are ¾ in. and 1½ in. Injection molded fittings are employed in making changes in direction.

High purity water is required in substantial quantities. It is used in washing refrigerators with an alkali-water solution, and in final rinsing operations, prior to the application of porcelain enamel.

Deionized water, instead of distilled water, is used since it most economically meets GE's needs in this instance. The elimination of ions prevents discoloration of the enamel.

Two deionizer units are used, each having two absorption towers and a capacity of 60 gpm. They form a central system that serves both the refrigerator unit and cabinet buildings.

Inverted Heater Warms Hangar and Engines

. . . cuts fuel cost $600 below estimates

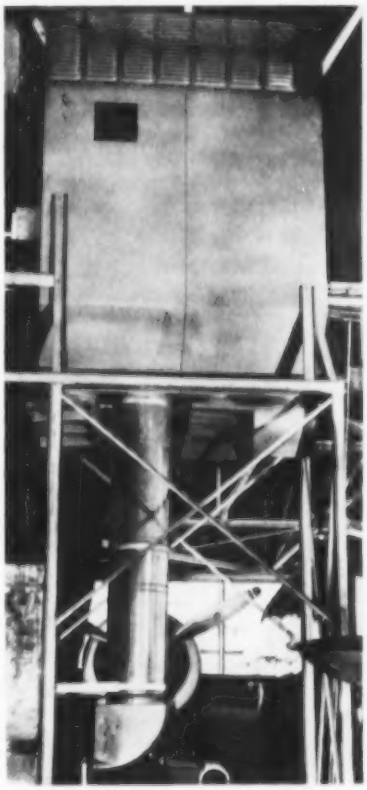
WINTER COMFORT in a uniform working temperature of 60 F has been achieved at the B. F. Goodrich Co.'s Akron hangar by the use of a gas fired heater with an output capacity of 2 million Btu per hr, according to the Dravo Corp. The heater is mounted upside down 14 ft above the working level.

One perpendicular duct down to about waist-high level with a nozzle at the end directs the air to warm up plane engines, without penalty to the rest of the working area. Warmup previously took as long as 1½ hours. Now, it takes 15 or 20 minutes because of the high level of temperature maintained throughout the hangar.

In addition, the fuel bill for 1954-55 season — $1540 — was about $600 under estimates.

A constant volume of 22,000 cfm of air is circulated in the building through the directional nozzles. The hangar air is mixed with filtered outside air in a plenum chamber adjoining the heating equipment. From the plenum chamber, 80 percent of the air passes through the heater. The remainder goes through a bypass duct to mix again with the heated air before it enters the distribution nozzles.

An electric timing device was added to the thermostat control so that the night employees can set the morning "on" temperature time before leaving. The control is mounted on a wall in the working area. ⫩



DOWNCOMER DUCT from inverted heater warms up engines in 100 x 140 ft hangar, with other nozzles maintains 60 F temperature

Giant Cooling System to Serve Government Plant

. . . involves seven buildings in Washington

CONSTRUCTION has been started on a giant cooling system to be installed in the Capitol power plant in Washington, D. C., according to Stewart Lauer, president of the York Corp. When completed, it will serve the air conditioning systems in seven large government buildings within a two mile circle of the plant.

Four large centrifugal refrigeration units using about 10,000 hp will provide chilled water to a loop system holding about 600,000 gal. Government engineers say it is the largest hydraulic refrigeration system of its kind in the world. ⫩

CONDENSER CIRCULATING PUMP, with a capacity of 1215 gpm, has an 80 ft head. Pump is installed in the steam plant of the Middletown, Conn., state hospital

NPSH = Net Positive Suction Head

Above Vapor Pressure

By following a few simple steps, you can also make it mean "No Problem with Suction Here" when applying centrifugal pumps.

By J. A. Cable

Application Engineer, Norwood Works, Allis-Chalmers Mfg. Co.

IF YOU ARE concerned only with pumping water out of an open tank at sea level and at a temperature less than 85 F, you don't have to read any further. You can think in terms of suction lift and let it go at that. But once you change any of these factors, NPSH is the only right way to summarize pump suction conditions.

There are two kinds of NPSH, that which the pump user has available and that which a particular pump will require.

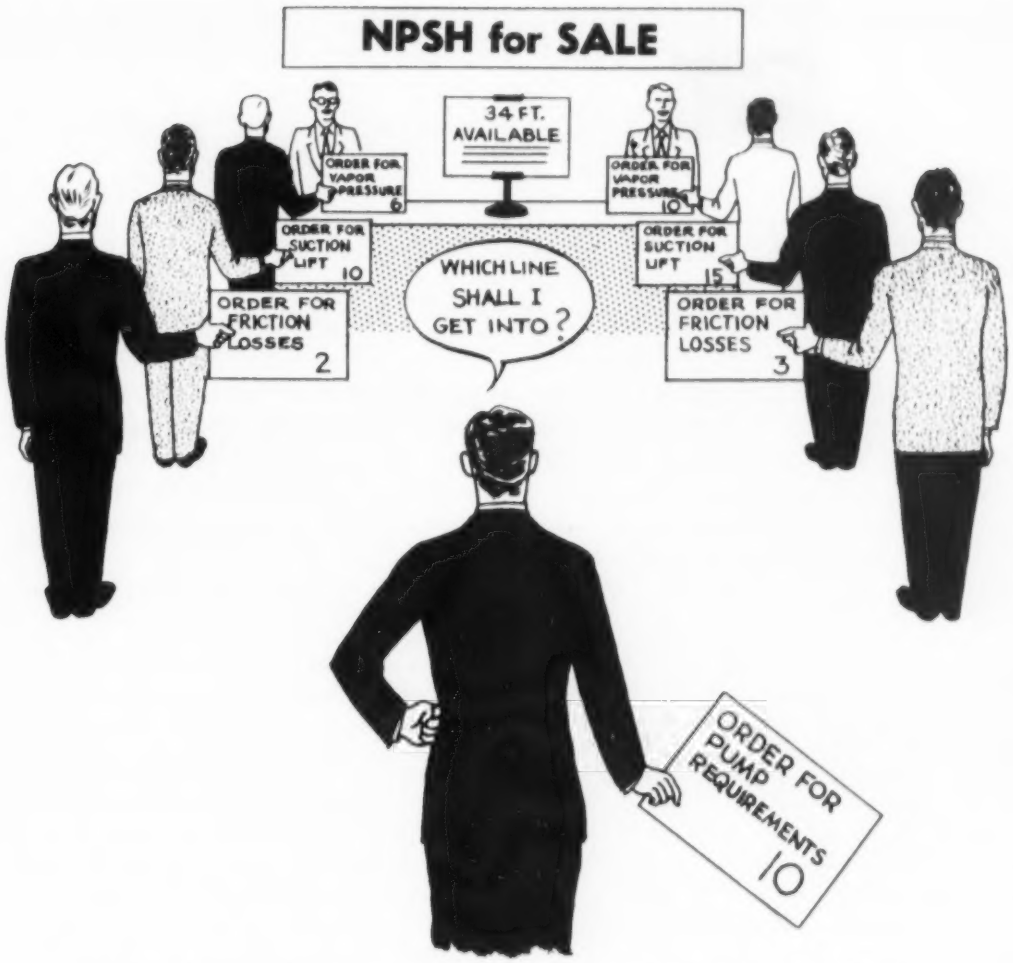
At sea level, atmospheric pressure can be said to "serve a helping of 34 ft of NPSH." All you have to do is to be sure that there is enough to go around for all of the factors to be "waited on" in your application. These factors are as follows:

1) Reduction in atmospheric pressure if the installation is much above sea level.

2) Vapor pressure of the product pumped at the pumping temperature.

3) Suction lift and friction in suction pipe line. Add the static suction lift plus all friction losses in the pipe and fittings. (On any lift application you will have a foot valve because centrifugal pumps have to start full of liquid to be primed or you will not be able to lift anything at all. Be sure to figure in the friction drop through this foot valve.)

At this stage, you tell the prospective pump supplier how much there is left as "available NPSH," and all he has to do is pick out a pump that


NPSH for SALE
34 FT. AVAILABLE
ORDER FOR VAPOR PRESSURE 6
ORDER FOR VAPOR PRESSURE 10
ORDER FOR SUCTION LIFT 10
ORDER FOR SUCTION LIFT 15
WHICH LINE SHALL I GET INTO?
ORDER FOR FRICTION LOSSES 2
ORDER FOR FRICTION LOSSES 3
ORDER FOR PUMP REQUIREMENTS 10

CHOOSING RIGHT PUMP is a matter of summarizing pump suction conditions, making sure that available NPSH — 34 ft at sea level — is adequate for friction losses, suction lift, and vapor pressure. Then, after these factors have been figured, pump selection must require less NPSH than is available

requires less than you have available.

Here is an example. A food plant near Flagstaff, Ariz., wants to pump 180 F water out of an open heated tank that is above the pump installation point by 2 ft. Looks easy, but let's see.

Since Flagstaff is about 7000 ft above sea level, the atmospheric pressure is less than sea level by about 3.5 psi, or 8 ft. Accordingly, we start out with 34 minus 8 ft, or 26 ft provided by the atmosphere.

Next, we take this 26 ft and apply point 2 above. You can get vapor pressure of 180 F water out of tables or curves from many sources. This is approximately 7½ psi, or 17 ft, and we then have 26 minus 17 ft, or 9 ft.

In this example, we had 2 ft of positive head on the suction, but this must be modified to suit friction losses in the suction pipe. So, 9 plus 2 ft, minus friction (assume 1 ft) equals 10 ft available NPSH).

This example was relatively simple, but we ended up with an application where the pump must require less than 10 ft of NPSH to do the job. Every one of these factors bears looking into.

$$NPSH = [(2.31)\ (P_a - P_v)]/SG + (H_e - H_f) \quad \ldots [1]$$

where, at the maximum possible pumping temperatures P_a = atmospheric pressure in psia. (This is 14.7 psia at sea level, or 34 ft but comes down about 1.1 ft for each 1000 ft above sea level.); P_v = Vapor pressure in psia; SG = Specific gravity; H_e = Elevation head. (When water level is above pump, this is a plus figure; if water is lifted to pump, this is a minus figure.); H_f = Friction head or friction loss in suction piping.

If your suction tank is enclosed, such as a vacuum vessel or evaporator, you usually have the liquid boiling at its surface, in which case $P_a = P_v$. The complete first term of our formula then becomes zero, so:

$$\text{Available } NPSH = H_e - H_f \quad \ldots\ldots [2]$$

From this discussion, you can figure your own available NPSH or see the importance of furnishing your supplier with correct data so that he can do so.

The answer, then, for the puzzled individual surveying the two lines before the "NPSH for Sale" counter in the sketch, is to get into the left line.

Sam Lewis' Page

Converters Replace Tubes-in-Boilers To Heat Skyscraper's Domestic Water

In a 28 story office building, domestic hot water until recently was heated by copper tubes inserted within the steam space of oil fired steam heating boilers. To prevent a tube from bursting under 195 psi — thus filling the boiler with cold water — separate converters were installed to heat the water for two zones in the building.

LONG AGO, for two- or three-story apartment buildings in Chicago, the custom was to insert through the head of a firebox type steel boiler long copper tubes. Sometimes they were in the steam space, sometimes in the hot water, just below the normal water level. City water circulated in and out through these tubes and, at city pressure, proceeded on to the faucets above the kitchen sinks and to the lavatories and baths.

The scheme was relatively inexpensive — and while the water may not have become dangerously hot — it worked well. Heat sensitive devices were developed to throttle the rate of flow, and rarely did the delivered water reach scalding temperature. The popularity of the scheme continued as automatic stokers and oil burners succeeded manual firing of coal. Modifications called "side arm heaters" were developed for sectional cast iron boilers.

But apartment buildings began to be 25 or 30 stories high, and domestic water systems often were separated into several horizontal zones. Each zone was served from an overhead house tank, and each zone had its separate steam heater for the locally circulated water.

The high pressure hydrostatic head then could be limited to that induced by the house pump pushing the cold water up to an overhead tank.

One office building of 28 stories, however, has an oil burning steam heating boiler plant. The boilers are good for a pressure of 30 psi and are located in a subbasement 30 stories down from the house tank. The domestic hot water in this building was heated for years by copper tubes inserted within the steam space of the boilers.

Thus, these tubes are subjected to 30 stories × 15 ft, or 450 ft head, plus resistance of the waterflow going up to the house tank. This is a total of more than 200 psi. The tubes within the steam space then have 200 psi pushing out, and perhaps 5 psi steam pressure pushing in.

Some day, that pressure of 195 psi pushed by the water in the house tank and the electric house pump near by will overcome the resistance of the heater and will burst a tube, filling the boiler with cold water. Probably the boiler will not burst, but the operating fireman will get very excited, and the tenants will go home until tomorrow or maybe next week.

Of course, I told the owner to make an immediate correction. I also told the friend who sold him the oil burners — they burn bunker C — I would shoot him for having installed an oil heater within the boiler. If that oil heater leaks oil into the boiler, as it may, or if boiler water gets into the oil tank, everyone around there ought to be shot!

These remarks of warning are not intended to detract from the tried and still extant method of heating domestic water with water taken from below the water level of a low pressure steam boiler, in a residence or in any building of conventional height. They are intended to sound a warning against careless engineering for skyscrapers.

The rate of deposition of salts upon a hot surface is said to increase rapidly above a critical temperature. Thus if heat is transferred from hot water to less-hot water, the heat transfer tubes show little evidence of scale deposit.

In this case, I heated the water in the upper zone — eight stories — with steam in a separate converter at low pressure, and in the lower zone — 20 stories — with steam in a separate converter in the boiler room. The high pressure water, in case of a burst converter, could not enter the boilers except at the will of the boiler feed pumps. ≠

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems.

Individual Ceiling Units Air Condition Existing Hotel

Individual air conditioning units installed in ceilings circulate cooled air in guest rooms of this hotel.

By Louis L. Hamig
Ferris & Hamig
Consulting Engineers

TYPICAL GUEST ROOM unit is suspended in passageway. Each unit is controlled by a wall thermostat and a two speed switch

INDIVIDUAL air conditioning units hung from corridor ceilings condition the guest rooms of the nine story Irvin Cobb Hotel, Paducah, Ky. Factory finished, the units are not furred in. Primarily, they circulate air in the rooms.

Other air conditioning units were installed in corridors to circulate 100 percent outdoor air to balance the amount of air exhausted by the toilet exhaust system.

All the units receive chilled water from a chiller in the basement, where two 100 hp reciprocating compressors and a common condenser are also installed.

Other areas served by the 190 ton system are the dining room, lobby, banquet room and other public areas.

A small grille over the door of each room allows the air from the corridor to be drawn through each guest room. (See photo above.)

Each guest room is provided with a thermostat to control a solenoid valve and a two speed motor switch.

THE IRVIN COBB HOTEL was open for business as usual during the installation of the 190 ton air conditioning system

Chilled water piping from the chillers in the basement was installed in a rear stairwell to a furred space above the top floor. Risers in closets serve two units on each floor.

Provision has been made so that at a later date hot water can be circulated through this system to heat with these units. However, it is felt that even as far south as Paducah it is better to have a source of heat at the outside wall rather than try to heat with interior suspended units.

Several other systems were considered but were not deemed feasible because of space requirements and the necessity of furring down corridor ceilings. The existing heating system, which was satisfactory, was not changed.

The air conditioning contractor was Shelby-Skipwith. ∔

The Law and Your Profits

By William Hurd Hillyer

Two Names Didn't Increase Profits

. . . for a certain heating and piping contractor who used separate names for his material supply firm and his contracting firm, both at the same address. Failing to finish paying for material which he had installed in a housing project, the subcontractor was ordered by the court to pay the unpaid balance when the manufacturer sued for the amount.

CLEVER DEVICES for added profits often result in troubles instead. A recent case illustrates the complications which can arise from doing unincorporated business under more than one title at the same address. While this is customary among certain ethical businessmen, it can engender difficulties for the ill informed.

Matt Erial Supply Co. and Temperature Mechanics were separate organization names under which John Duett did a heating and piping business. All names herein are fictitious. Under the cognomen of Temperature Mechanics he entered into a contract as subcontractor with Topall Construction Co., general contractor, to furnish and install heating and piping in Publico Housing Project.

Topall required completion bonds. Therefore, Duett secured I. S. Sollvent as indemnitor, both for Duett individually and for Duett's doing business under his trade names: Temperature Mechanics and Matt Erial Supply Co. He also obtained a surety bond from a large casualty company, securing payment of claims for labor and materials used in the work, wherein Temperature Mechanics "by John Duett" was named as principal, in favor of Topall Construction Co.

Using his trade name of Matt Erial Supply Co., Duett placed an order with Austral Heaters Corp., for 550 water heaters and 550 magnesium rods. These items were charged to Matt Erial Supply Co., but each invoice was carefully marked for "Publico Housing job." This equipment went directly to the jobsite from Austral's plant in a Duett truck. The truck driver, as well at other employees, were paid by Duett under the name of Temperature Mechanics. Matt Erial Supply had no payroll.

Whenever Matt Erial Supply Co. was billed by Austral Heaters, Duett's bookkeeper would bill Temperature Mechanics at a price mark-up. The bookkeeper afterwards testified in court that this mark-up was the difference between the manufacturer's price of $31 per unit and the wholesale price of $47. This resulted, or was intended to result, in a profit of $16 per unit to Duett in his capacity of Matt Erial Supply Co. No checks passed between Temperature Mechanics and Matt Erial, although some checks were received on this account by the indemnitor Sollvent, a sort of silent partner.

The heaters and rods were installed on the job. When they were partly paid for, remittances ceased. Austral filed and recorded a mechanic's lien for the balance and served on the casualty company a "notice of furnishing materials."

The supreme court awarded the manufacturer, Austral Heaters, the amount of its claim for the unpaid balance due on all the items of heating equipment. Thereupon the casualty company appealed on two points. It claimed: (1) that the surety company was not liable for the default of Matt Erial Supply Co. because it contracted only for the liability of Temperature Mechanics, and (2) that the manufacturer, having furnished supplies as a material man, was not entitled to the benefits of a mechanic's lien, nor to an action on the surety bond.

Affirming the lower court's decision in favor of the manufacturer against the casualty company (and therefore, indirectly, against Duett), the district court of appeal first of all took the ground that in complying with the mechanic's lien law, a proper interpretation shall "be construed most strongly against the surety and in favor of all persons for whose benefit it is given."

The higher tribunal then reduced contractor John Duett's business setup to its essentials, namely, that he operated one business at one address. True, he had recorded two trade names under sections of the civil code, which — the learned judges remind us — are designed to protect persons dealing with an individual doing business under a "fictitious" designation. "This was a device" by which Duett "presumably hoped to profit but apparently did not succeed."

The court of appeal supported the trial court's implied finding that Duett was "a subcontractor, acting under the general contractor or as agent of the owner and that he was not a materialman." Thus, all his ingenuity, by which he imputedly hoped to evade obligation and enjoy secret profits, came to naught. ⊣

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

How To Avoid Fan Platform Vibration

By John H. Shrock
Engineer,
The New York Blower Co.

VIBRATION in a fan installation can be caused by either the fan assembly or a poorly designed platform beneath the fan. Since the two causes can magnify each other, it is not uncommon to find a fan slightly out of balance operating roughly because of poor platform design.

Every platform will bend to some extent when supporting a load. The amount of bending — deflection — depends upon the platform size, weight, material, span between supports, and the load it carries. Any vibration of the fan, motor, or drive will tend to cause the platform's deflection alternately to increase and decrease. If the construction of the platform is such that its natural cycle of flexing is the same as the revolutions per minute of the fan, the platform will tend to bounce, as an acrobat on a trampoline.

In designing a platform for fans, or in correcting a faulty application, look for the following:

A *Unbalance, misalignment, and other items discussed in the November* 1955 *HPAC Data Sheet.*

B *A platform with a vibration cycle near the fan rpm.*

If the platform is such that the static deflection can be calculated (when loaded), the natural vibration in cycles per minute is:

$$187.7/\sqrt{\text{deflection in inches}}$$

The platform should have a vibration cycle 25 to 35 percent greater than the rpm of the fan. Where the fan platform is on the floor of a building, the vibration cycle of the floor should also be considered.

For example, to calculate the static deflection of a platform on which a fan and 15 hp motor are mounted on two "I" beams, several factors need to be known:

1) The fan weighs 1500 lb and runs at 1000 rpm. It is mounted on the two "I" beams and on two shorter cross beams, such that one-half its weight plus one-half the weight of the cross beams is borne by each main beam.

2) The motor weighs 400 lb and runs at 1760 rpm. It is mounted on two cross beams, such that two-thirds of its weight is borne by one main beam.

3) All beams are 14 in. by 10 in. 74 lb wide flange. The main beam span is 10 ft, freely supported at the ends. Cross beams are 46 in. long. The fan centerline is 1 ft from the center of the span. The motor centerline is 2 ft from the center in the opposite direction.

The static deflection is the sum of deflections due to beam, fan, motor, and cross beam weights. One beam carries more weight than the other, so it will be calculated first.

- Deflection due to main beam weight

$$D_1 = 5wl^4/384EI \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [1]$$

where D_1 = deflection due to main beam weight; w = weight per inch; l = span in inches; E = modulus of elasticity, 30 million psi; and I = moment of inertia, 796.8 in.⁴ (from steel handbook).

Thus:

$$D_1 = 5(74/12)\ (120)^4/384(30)\ (10)^6\ (796.8) = 0.000695 \text{ in.}$$

- Deflection due to fan and its cross beams

$$D_2 = Pab\ (a + 2b)\sqrt{3a\ (a + 2b)}/27EIl \quad \ldots\ldots\ldots [2]$$

where D_2 = deflection due to fan and its cross beams; Pab = one-half fan weight plus one-half cross beam weights; [P = 1500/2 + 46(74/12) = 1034 lb]; a = distance from fan centerline to near support, in.; and b = distance to far support.

Thus:

$$D_2 = 1034(48)\ 72(48 + 144)\sqrt{144(129)}/27(30)\ (10)^6\ (796.8)\ 120 = 0.001470 \text{ in.}$$

- Deflection due to motor and its cross beam

$$D_3 = Pab\ (a + 2b)\sqrt{3a\ (a + 2b)}/27EIl \quad \ldots\ldots\ldots [3]$$

where D_3 = deflection due to motor and its cross beam; P = two-thirds motor weight plus one-half cross beam weight [P = 2/3(400) + 46(74/12) = 551 lb]; a = distance from motor centerline to near support, in.; and b = distance to far support.

Thus:

$$D_3 = 551(36)\ 84(36 + 168)\sqrt{108(204)}/27(30)\ (10)^6\ (796.8)\ 120 = 0.000653 \text{ in.}$$

- Total static deflection, in.

$$0.000695 + 0.001470 + 0.000653 = 0.002818$$

- Natural vibration, cycles per minute

$$187.7/\sqrt{0.0028.8} = 3540$$

Although this is more than ample to prevent vibrating with the fan cycle, it is almost exactly twice the speed of the motor and might be disturbing. A lighter

HPAC DATA SHEET

beam could still be ample for fan and motor both. For example, a 12 in. by 10 in. 50 lb wide flange beam under the same conditions as above would have a natural period of 2570 cycles per minute. The other main beam could be calculated in the same way but would undoubtedly be satisfactory.

C *Platform of insufficient mass.*

A heavy platform will tend to dampen the vibrations due to motor, fan, and pulley unbalance. It will also absorb noises due to motor magnetic hum, belt, and bearing sound.

A good rule of thumb where it is too difficult to calculate the vibration cycle of a platform is to make it weigh two or three times as much as the fan and motor. For this reason, the best all 'round platform is a concrete slab.

D *Where the platform rests on vertical supports* — or is not on the ground floor — the fan is best set directly over the horizontal supports. Additional diagonal bracing is desirable.

E *Where the platform is suspended,* the hangers should be diagonally braced to prevent swaying. Small diameter rods may have strength enough to support a platform but not be rigid enough to prevent it from swaying.

F *Where the installation is to be made in an especially noise sensitive area,* it is sometimes desirable to place isolators between the fan and platform or beneath the platform. The most common materials are cork, rubber-in-shear, and steel springs.

Rotating fans set up two disturbing frequencies of vibration and noise: (1) Unbalance causes a disturbance at the fan rpm. (2) The other is caused by pressure waves created by the fan blades passing the outlet and equals the rpm times the number of blades.

In industrial applications, the fan rpm is often of primary importance in selecting isolators because of material and dirt deposits on the wheel. In ventilating applications, the critical design frequency is the rpm times number of blades.

If cost were of no concern, or the design frequency very low, the isolators could be individually designed for each application on the basis of fan and motor weight, rpm, and number of blades. Then the isolators would be designed so their static deflection under fan and motor load would give a natural frequency of vibration no more than four-tenths of the design frequency.

Fortunately, the characteristics of the two principal isolator mediums — cork and rubber-in-shear — are such that isolators may be designed on the basis of fan weight and size only in all but the most critical cases. This allows standardization of dimensions, with resulting advantages to isolator and fan manufacturers, application designers, and users.

1) Cork is preferred by many engineers because of its physical properties. Unless exposed to strong alkaline solutions or prolonged cycles of moistening and drying, it can be used to 200 F. Cork finds its best application where the design frequency is above 1800 cycles per minute. Normal nonoverloading fan frequencies run 2000 cpm and up. Forward curved fan frequencies are 6000 cpm and up.

Cork may also be used in slab form under and around a concrete pad.

2) Rubber-in-shear should not be used where it would be exposed to sunlight, oil, or temperatures above 150 F. Rubber, too, finds its best application where the design frequency is above 1800 cpm but may be used as low as 1200 cpm. Unfortunately, the flexibility of rubber makes it necessary to tie the fan and motor together on a common base. The disadvantages of this are mentioned above under (1) immediately above.

3) Steel springs are more costly than cork or rubber-in-shear but provide the best isolation medium for extremely sensitive applications or where the critical frequency is below that recommended for cork or rubber-in-shear.

To assure a structurally well-designed fan installation:

- Install a fan that has been statically and dynamically balanced. High speed or large fans should have been given a running check after assembly.
- Calculate the vibration cycle of the platform, or
- Pour a concrete slab that weighs two or three times as much as the fan and motor.
- Make sure all vertical supports are diagonally braced to prevent swaying.
- Use canvas inlet and outlet connections where practical. ✻

HEATING, PIPING & AIR CONDITIONING
AMERICAN SOCIETY OF
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Journal Section

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

Air Velocities in Two Parallel Ventilating Jets

By Alfred Koestel* and J. B. Austin, Jr.**, Cleveland, Ohio

This paper is the result of research sponsored by the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC. in cooperation with Case Institute of Technology, Cleveland, Ohio

SUMMARY — The flow pattern resulting from two close-spaced parallel air jets is described, and equations substantiated by test data are given for determining the maximum jet velocities at any distance from the nozzles. These equations will provide a designer the means for estimating the effect of air stream interference resulting from grilles and other outlets located near each other.

IN THE DESIGN of air distribution outlets the factors of primary concern are the air flow pattern, or cross-sectional velocity distribution, and the maximum velocities encountered at a given distance from the nozzles. When analyzing the behavior of two relatively close-spaced jets it is worthwhile to have equations by which the maximum velocities may be estimated. In addition, it is desirable to establish principles by which equations may be derived for determining velocities anywhere in the jet stream.

The problem is one of interference, considering one jet as interfering with another. The principle involved is that of one jet superimposing upon another, whereby the respective momenta become additive in accordance with the laws of momentum.†

Equations with experimentally evaluated constants are presented in this paper in a form such that a designer of air distribution systems may estimate the maximum jet velocities at a given distance from the jet nozzle, or such that he may estimate the jet throw when applying an arbitrary terminal velocity.

The detailed mathematical analyses will appear in the Appendix which will be published with the paper in the ASHAE TRANSACTIONS.‡

Twin Parallel Air Jets

An air jet discharged from a nozzle will have a cross-sectional velocity profile which can be approximated by a normal probability curve. When two parallel air jets interfere with each other the resulting velocity profile is as shown in Fig. 1. In each jet there is a constant outlet velocity core, and the jet behaves independently until a point is reached at which the two interfere. In Fig. 1, "A" is the point of interference, and its distance out from the nozzles varies with the distance between the nozzles. From the point of interference on out, the two jets may be considered

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For presentation at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC., Washington, D.C., June 1956.

†Similar work on twin jet interference was performed by the University of Illinois at about the same time as it was at Case Institute of Technology in 1952. The jet investigations made at Case covered greater distances from the nozzles and lower nozzle outlet velocities. The resulting equations differed from those of the University of Illinois in form, but were based upon the same principle of superposition.

‡Mimeographed copies of the Appendix may be obtained on request from the ASHAE Laboratory until it is published in the TRANSACTIONS.

as superimposing or interfering, and the velocity profile is the result of their combined momenta.

From the nozzles to the point of interference, the maximum velocity, as for a single jet, will be on the centerline of each jet. Then the velocity on a line midway between and

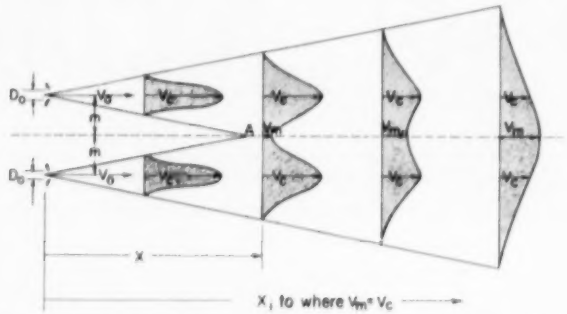

Fig. 1—Diagram of two parallel jets showing velocity profiles produced by interference

parallel to the two jet centerlines increases until it equals the jet centerline velocity. The distance from the nozzles to this point is X_1. From this point on, the maximum velocity of the combined jet stream is on the midway line, and the profile is almost as though emanating from a single nozzle of twice the area of one of the two nozzles.

Equations and Their Applications

Applying the principle of conservation and addition of momentum, or superposition, the centerline velocity of a single jet in the presence of another twin jet can be found by Equation 1

$$\frac{V_c}{V_o} = \frac{K}{X/D_o}\left[1 + e^{-.16\left(\frac{2m}{X}\right)^2}\right]^{\frac{1}{2}} \qquad (1)$$

The symbols are defined in the Nomenclature.

The velocity on the line midway between the two jet centerlines may be determined by Equation 2

$$\frac{V_m}{V_o} = \frac{K\sqrt{2}}{X/D_o}\, e^{-\frac{1}{2}\left(\frac{2m}{X}\right)^2} \qquad (2)$$

In determining the maximum velocity in a twin jet stream at a given distance, X, from the nozzles, both the above equations may be solved to see which yields the greater value of velocity. The alternative method is to solve for X_1 by means of the equation,

$$X_1 = 2.56\,Km \qquad (3)$$

Equation 3 gives the value for X_1 at which distance V_c equals V_m. If the distance in question is less than X_1, the maximum velocity may be found by Equation 1. If X is greater than X_1, the maximum velocity will be on the midway line and may be found by using Equation 2.

At large values of X/m the exponential term of each, Equations 1 and 2, is seen to approach a value of one, and both equations become,

$$\frac{V_c}{V_o} = \frac{V_m}{V_o} = \frac{K\sqrt{2}}{X/D_o} \qquad (4)$$

This is also the equation for the maximum centerline velocity of a single jet when the jet area is doubled. In addition, Equation 4 applies when a single outlet is located adjacent to a wall or ceiling, and the air is discharged along the surface.[1]

Thus, in using Equation 1 or 2 to determine the maximum velocity in a twin jet stream at a given distance from the nozzles, it is necessary to know the nozzle diameters, the distance between the nozzle centerlines, the outlet velocity, and some value for K. At large values of X, the distance between the nozzle centerlines is insignificant, and the jet behaves as a single jet for which Equation 4 then applies.

The value of K to be used apparently varies with outlet size and velocity.[1] It has been found from this investigation that, for an outlet velocity of 3000 fpm through a 1-in. nozzle, the equations agree well with the test data when K equals 4.5.

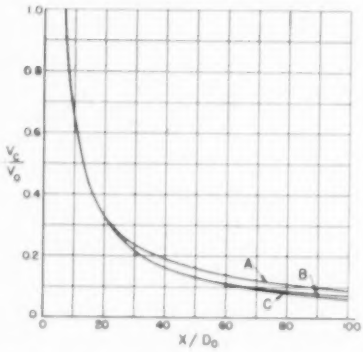

Fig. 2—Plot of Equation 1 for various distances between two nozzles with K equal to 6.5; A is $2m/D_o = 3$ (Twin parallel jets); B is $2m/D_o = 8$ (Twin parallel jets); C is single jet

For outlet velocities of 23,000 fpm from nozzles of similar size,[2] a K of 6.5 gives better test agreement with Equations 1 and 2. There are experimental indications that K is a function of the Reynolds number evaluated at the discharge nozzle only when the Reynolds number is low. For a Reynolds number greater than about 3×10^4, values of K will be greater than 6.0. Values of K can be expected to lie between 6.5 and 4.0 where the lower values are for small size outlets and low velocities.

Nomenclature

- V_o = outlet velocity (at vena contracta), feet per second.
- V_c = jet velocity along the centerlines through the nozzles, feet per second.
- V_m = jet velocity along a line midway between the two nozzles, feet per second.
- X = distance from apparent point source (assumed to lie on the face of the outlet), feet.
- $2m$ = distance between the two nozzles measured from the nozzle centers, feet.
- X_1 = equi-velocity distance or the distance X at which V_m equals V_c, feet.
- D_o = diameter of nozzle, feet.
- K = constant, length in diameters of the constant velocity core.
- e = the base for the Napierian system of logarithms $e = 2.718$.

Simplifying Assumptions

Assumptions underlying Equations 1 and 2 are as follows:

1. Outlet velocities from each of the twin jets are equal.
2. No external forces act upon the jets other than the pressure behind the nozzle; *i.e.*, they are considered free except for the interference of one with the other.
3. The absolute value of the air density is constant throughout the jets.
4. The angle of expansion for the velocity profiles is constant.
5. The apparent point source of each jet lies on the face of the nozzle outlet.

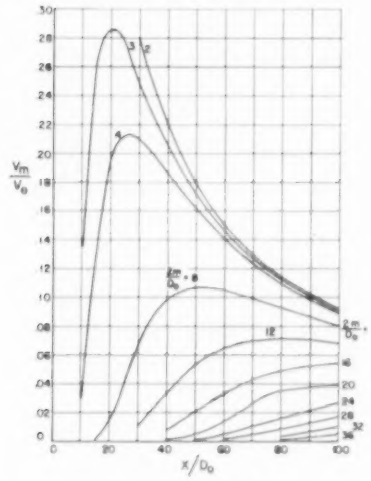

Fig. 3—Plot of Equation 2 for various distances between twin parallel nozzles with K equal to 6.5

This may not be exactly true and will only affect results close to the nozzle.

Comparison With Test Data

Fig. 2 is a plot of Equation 1, with a K of 6.5 for different spacings between nozzles. For a nozzle spacing of 8 diameters and a distance out from the nozzles of 100 diameters, the velocity on the jet centerline is just slightly greater than for a single jet without interference. At the same distance out and at a nozzle spacing of 3 diameters, V_c is 28 percent greater than for a single jet. The velocities V_c or V_m for a twin jet can never be greater than 1.414 times the velocity V_c of a single jet when the contrast is made on the basis of the same outlet velocity, V_o, and the same size, D_o. Equation 4 differs from the equation for a single jet only by the factor, $\sqrt{2}$, as shown by Equation 5 for a single jet.

$$V_c/V_o = K/(X/D_o) \quad \ldots\ldots\ldots (5)$$

The curves of Fig. 2 originate at $X/D_o = 6.5$ and $V_c/V_o = 1$, since from Equation 5 at $V_c/V_o = 1$, $X/D_o = K$. This distance represents the approximate length of the constant velocity core of the jet.

Fig. 3 is a plot of Equation 2 similar to Fig. 2. As X becomes infinitely large in both Figs. 2 and 3, the family of curves tends to coincide and become asymptotic along the X-axis.

Tests conducted at Case Institute of Technology were made on two

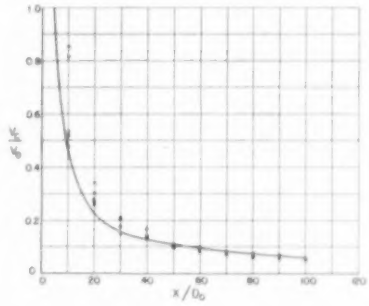

Fig. 4—Comparison between Equation 1 (curve) with K equal to 4.5 and data (circles) from Case Institute of Technology. Data:—V_o = 3000 fpm, 5 in. between nozzle centerlines, two 1-in. nozzles

1-in. diameter nozzles with a spacing of 5 in., and the results are plotted in Figs. 4 and 5. The curves of Figs. 4 and 5 are based on a K value of 4.5, and the data were obtained at a nozzle velocity of about 3000 fpm. A map of the field velocity distribution covering a distance out to 100 diameters is shown for a typical test in Fig. 6. Velocity measurements were made with a calibrated bridled vane anemometer.

Test results obtained at the University of Illinois[2] are shown in Figs. 7 and 8, where the jet centerline velocities and the velocities at the midway line are compared with Equation 2 for a K equal to 6.5. Measurements were made on two 0.898-in. diameter nozzles spaced 3 in. apart, and velocity traverses were made out to a distance of 30 diameters. The outlet velocity was 23,000 fpm. Measurements were made with a total-head impact tube.

Practical Example

As a simple example in finding the magnitude of the jet velocities produced by two nozzles spaced in parallel, consider two 1-ft diameter nozzles with a centerline spacing of 2 ft discharging isothermal air at a velocity of 1000 fpm. It is required to find the maximum jet velocity at (*a*) a distance of 10 ft from the nozzles and (*b*) at a distance of 20 ft from the nozzles.

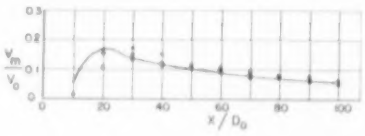

Fig. 5—Comparison between Equation 2 (curve) with K equal to 4.5 and data (circles) from Case Institute of Technology. Data:—V_o = 3000 fpm, 5 in. between nozzle centerlines, two 1-in. nozzles

Assuming a K equal to 6.5, the equi-velocity distance out from the nozzle, according to Equation 3, is

$$X_1 = 2.56 \times 6.5 \times 1 = 16.7 \text{ ft}$$

Therefore, at a distance of 10 ft, which is less than the equi-velocity distance of 16.7, the maximum jet velocity can be computed from Equation 1:

Solution (a)

$$V_c = 1000 \times \frac{6.5}{10/1}\left[1 + e^{-16\left(\frac{0.5 \times 1}{10}\right)^2}\right]^{\frac{1}{2}}$$

$$V_c = 1000 \times [6.5/(10/1)] \times (1.00114)^{\frac{1}{2}} = 651 \text{ fpm}$$

At a distance of 20 ft, which is greater than the equi-velocity distance of 16.7, the maximum jet velocity can be computed from Equation 2:

Solution (b)

$$V_m = \frac{1000 \times 6.5\sqrt{2}}{20/1} e^{-\left(\frac{0.5 \times 1}{20}\right)^2}$$

$V_m = [1000 \times 6.5/(20/1)] \times 1.145 = 372$ fpm

Equation 4 could have been applied only for large distances from the outlet or if it were assumed that the two nozzles are so closely spaced so as to behave as a single outlet.

practice, it is recommended that a K value of 6.5 be used in Equations 1, 2 and 4. Hence, if the outlet in question happens to have an exceptionally low discharge velocity, the velocities predicted from Equations 1, 2 and 4 will be on the safe side, higher than the actual jet velocities.

The validation of Equations 1 and 2 rests upon test results obtained from

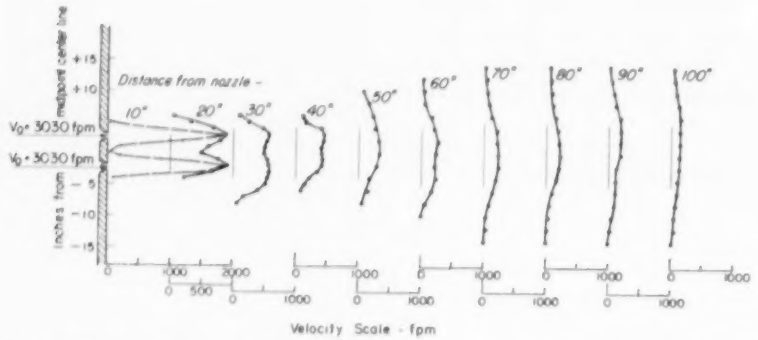

Fig. 6—Measured velocity distribution in a twin jet field. Two 1-in. nozzles, 5 in. between nozzle centerlines. Data from Case Institute of Technology

Conclusions and Recommendations

The equations presented in this paper permit a designer of air distribution systems to determine the maximum velocity in a jet stream issuing from two parallel nozzles. The method of deriving the equations is included in the Appendix. This principle of adding momenta, or superposition of interfering jets, can be applied similarly but with more difficulty to more than two jets. Detailed equations by which the entire jet velocity profile can be defined are not presented in this paper; the basic equations presented in the Appendix can be manipulated to formulate velocity profile equations.

When relatively large-sized outlets are encountered in air-conditioning

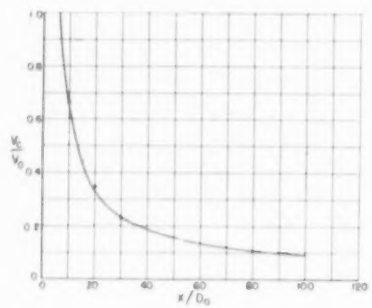

Fig. 7—Comparison between Equation 1 (curve) with K equal to 6.5 and data (circles) from the University of Illinois. Data:— V_0 = 23,000 fpm, 3 in. between nozzle centerlines, two 0.898-in. nozzles

two twin-nozzle configurations; namely, two 0.898-in. diameter nozzles spaced 3 in. apart, and two 1-in. diameter nozzles spaced 5 in. apart. It is recommended that additional data be obtained covering a greater range of outlet sizes, dimensions, and spacings.

Care should be taken when applying the equations to practical-type outlets which have discharge velocity patterns that are different from those of the idealized conditions of the experiment. Deviations can be expected between the jet velocities computed from the equations and the actual velocities when these are below about 150 fpm; the actual velocities will be less than those computed by formula.

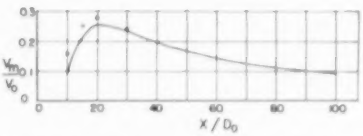

Fig. 8—Comparison between Equation 2 (curve) with K equal to 6.5 and data (circles) from the University of Illinois. Data:— V_0 = 23,000 fpm, K = 6.5, 3 in. between nozzle centerlines, two 0.898-in. nozzles

Acknowledgments

The authors are indebted to Prof. G. L. Tuve for his help and suggestions. The experimental work was performed by J. J. Reinmann, student in mechanical engineering. The figures were prepared by Mrs. Ruth Strahosky.

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2. Transport of Momentum, Mass, and Heat in Turbulent Jets, by L. G. Alexander, T. Baron, E. W. Comings (University of Illinois Engineering Experiment Station, *Bulletin Series No.* 413).

Comparative Performance of Indirect Water Heaters

By L. L. Hill* and W. S. Harris**, Urbana, Ill.

IN HOMES using steam or hot water as the heating medium, it is common practice to supply hot water for domestic use by an indirect water heater which is, basically, an exchanger for transferring heat from the boiler to the domestic water. The heat transfer surface generally consists of coiled or *U*-shaped copper tubes submerged in the boiler water with domestic water circulating inside the tubes so that the two water circuits are separated and never mix.

Indirect heaters may be classified as to type (storage or tankless), and as to location with reference to the boiler (external or internal). The external heater has the heat transfer coils encased in a steel or cast-iron shell located outside the boiler; it thus requires the addition of suitable piping to enable boiler water to circulate over the coils. The internal heater is screwed into or bolted onto the boiler and extends directly into the boiler proper. A storage type heater requires less coil surface than a tankless heater because a reserve supply of hot water can be stored in the tank against periods of peak demand. A tankless heater, on the other hand, has no storage tank and requires a large heat transfer surface to provide sufficient hot water to handle maximum loads.

Since performance data on indirect water heaters were meager, an extensive research program on this type of equipment was initiated at the University of Illinois in 1942 as a part of the research program sponsored by the *Institute of Boiler and Radiator Manufacturers*. The first tests were made during the summers of 1942 and 1943 and the winter of 1943-44.[1] These tests were run using an internal storage type heater located in the oil-fired boiler and connected by suitable piping to a horizontal, insulated, 30-gal hot water storage tank.

SUMMARY—In homes using steam or hot water as the heating medium, it is common practice to supply hot water for domestic use by means of an indirect water heater attached to the house heating boiler. Since performance data on indirect water heaters were meager, an extensive research program was undertaken at the University of Illinois under the sponsorship of the *Institute of Boiler and Radiator Manufacturers* to determine the availability of hot water and the cost of heating water for each of three types of indirect water heaters under both summer and winter conditions of operation. Curves are presented showing the ability of the different heaters tested to meet various hot water demands. The report also contains an analysis of operating costs for numerous operating conditions and rates of water usage.

The present paper deals with a later investigation which included tests on an external tankless heater and on both internal and external storage type heaters. All heaters were used with the gas-fired house heating boiler in the I=B=R Research Home. The two storage type heaters were tested with both 30 and 66 gal horizontal hot water storage tanks.

Basic objectives of the test program were to determine the availability of hot water and the cost of heating water with each of three types of indirect water heaters under both summer and winter conditions of operation.

Description of Equipment

The Research Home was a two story dwelling designed and furnished to represent a well-built American home of 1940. Total calculated heat loss for the house (excluding basement) was 43,370 Btuh at temperatures of −10 F outdoors and 70 F indoors.

The domestic water heating system consisted of a gas-fired boiler, an indirect water heater, a water tempering tank, and, in the case of storage type heaters, a hot water storage tank. The boiler was equipped with a conversion-type gas burner, adjusted to a burning rate of approximately 100 cfh. Fuel was natural gas—heating value 1000 Btu per cu ft. A schematic diagram of a typical test setup is shown in Fig. 1.

During the 1948-49 heating season, when winter operation of indirect water heaters was studied, a one-pipe, forced-circulation, hot water heating system was used with convectors in all rooms.

The three heaters used are shown in Fig. 2. The internal storage type heater was of the trombone type consisting of three ¾ in. copper *U* tubes having a heating surface of nearly 2 sq ft. It extended 21 in. into the back section of the boiler and was located 4 in. above the level of the low limit control. Insulated 1-in. pipe

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For presentation at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Washington, D. C., June 1956.

[1]Performance of an Indirect Storage Type Water Heater, by A. P. Kratz and W. S. Harris, (University of Illinois, *Engineering Experiment Station Bulletin* 366, 1947).

connected the heater to the storage tank.

The external storage type heater consisted of a single, helical, copper coil in a cast-iron shell measuring 18 in. in diameter and 60 in. in length, was similarly insulated but the depth of the insulation was 1½ in. The measured water capacities were 242 lb and 515 lb for the 30-gal and 66-gal tanks, respectively. The tank used to store the hot water was suspended in a horizontal position near the basement ceiling.

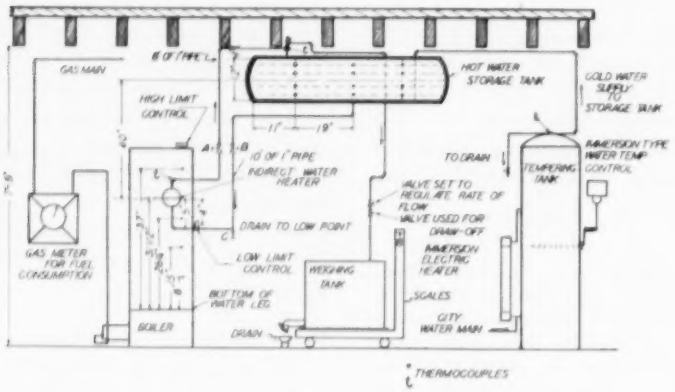


Fig. 1—Diagram of test equipment

12½ x 7½ in. Although located outside the boiler, it was placed at the same level as the internal storage type heater in order to keep the circulating head and the length of pipe connecting the heaters to the storage tank the same in both cases. Like the internal heater, the heating surface of the coil was about 2 sq ft. The external heater was covered with magnesia insulation to a depth of about 1 in. and was connected to the boiler with insulated 1¼-in. pipe and to the storage tank with insulated 1-in. pipe.

The tankless heater was composed of copper *U* shaped coils having a heating surface of 14 sq ft, located within a cast-iron shell 11½ x 16¼ x 8½ in. overall. Boiler water circulated to the heater through insulated 2-in. pipe, and ½-in. pipe was used on the domestic hot water circuit. The heater was covered with 1 in. of magnesia insulation.

Thirty gal and 66 gal storage tanks were used. The shell of the 30-gal tank, 12 in. in diameter and 60 in. long, was insulated on the sides with 4-ply corrugated asbestos 1 in. thick, and on the heads with 1 in. of magnesia insulation. The 66-gal tank,

Operation of the burner and circulator was regulated by a conventional set of controls consisting of a room thermostat, a low limit control, a high limit control, a magnetic gas valve, and a safety pilot. The heat-anticipating room thermostat, which controlled the operation of both burner and circulator, was placed in the living room 30 in. above the floor. The direct-acting, low limit control, of the immersion type, was located in the rear section of the boiler approximately 26 in. above the bottom of the water leg. This control started the burner whenever the temperature of the water in the boiler reached a prescribed minimum. The high limit control was located in the top of the back section of the boiler. A flow control valve prevented circulation of boiler water through the heating system except when the circulator was operating.

In order to regulate the temperature of the cold water supply the tempering tank was equipped with an immersion type water temperature control operating a 250-watt immersion electric heater.

Copper constantan thermocouples were used to measure the temperatures of: (*a*) the cold water supply, (*b*) the water drawn off, (*c*) the domestic water at the inlet and outlet of the heater, (*d*) the boiler water entering and leaving the heater, and (*e*) the water at different levels in the boiler and storage tank. These thermocouple locations are shown in Fig. 1. A 10-point recording potentiometer provided a continuous record of water temperatures at selected points in the system. Water was weighed on platform scales sensitive to 0.01 lb, and the gas consumption was measured by a special test meter reading directly to 0.01 cu ft.

Availability of Hot Water

Automatic Washer Draw Off Tests: Water requirements for an automatic washing machine present one of the heaviest demands for hot water. Consequently water was drawn off at intervals simulating automatic washing machine demands for hot water, both as to quantity and frequency of draw off. The schedule used is given in Table 1. It represents a complete wash cycle from the time clothes are loaded into the machine until they are taken out damp dry. It was developed from hot water requirements as obtained from several automatic washing machine manu-

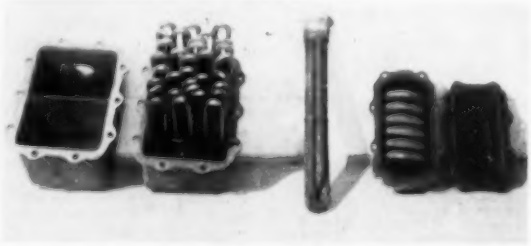


Fig. 2—Heaters used in tests

facturers. The quantities shown are based on a total water requirement of 8 gal per fill. To test for the availability of hot water from any heater, hot water was drawn at the times and in the quantities indicated in Table 1, and the complete cycle

Table 1—Automatic Washer Schedule

Time (min)	Operation	Water Used (gal)		Water (F)
		150 F*	70 F	Temp for Operation
0 - 5	Load	—	—	
5 - 15	Soak	3.00	5.00	90 - 110
15 - 27	Wash	8.00	—	140 - 160
27 - 28	Spray rinse	2.00[b]	3.00	90 - 110
28 - 35	First rinse	3.00[b]	5.00	90 - 110
35 - 41	Second rinse	5.00	5.00	90 - 110
41 - 45	Dry	—	—	

*Figures this column are water supplied by the heater.
[b]Combined in tests to one draw of 5 gal.

was repeated as often as the water was hot enough for use.

A log of typical automatic washer tests is shown in Fig. 3, with results for both the tankless heater and the storage type heaters. Assuming 125 F to be the lowest useful water temperature, Fig. 3 shows that when using a low limit control setting of 185 F, a cold water supply temperature of 80 F, a 66-gal storage tank, and a storage type heater, as many as seven consecutive tubs of clothes could be washed; if the cold water supply was 60 F the limit was five tubs. Because of the large storage capacity of the 66-gal tank, there was little change in temperature during any draw off. Replacing the 66-gal tank by a 30-gal tank limited the number of consecutive washes to three if the temperature of the cold water supply was 80 F, and to two if the cold water temperature was 60 F. Mixing of the cold and hot water was evident in the tests in which the 30-gal tank was used. During the first cycle, the water temperature dropped from 187 F at the start to below 150 F at the conclusion. In the second cycle, it dropped to 130 F when using 80 F inlet water and below 125 F when using 60 F water. During the wash period of the second cycle (8 gal of hot water used), the water temperature dropped nearly 15 F. Thus, use of the 66-gal tank not only enabled more tubs of clothes to be washed, but also resulted in more uniform water temperatures throughout the time that the water was being drawn.

There was no limit on the number of wash cycles which could be completed when using the tankless heater

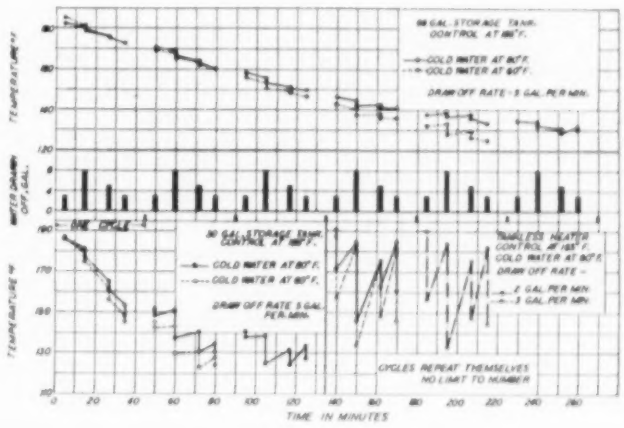

66 GAL. STORAGE TANK CONTROL AT 185°F.
COLD WATER AT 80°F.
COLD WATER AT 60°F.
DRAW OFF RATE - 3 GAL. PER MIN.
TEMPERATURE °F
WATER DRAWN OFF, GAL.
ONE CYCLE
30 GAL. STORAGE TANK CONTROL AT 185°F.
COLD WATER AT 80°F.
COLD WATER AT 60°F.
DRAW OFF RATE 3 GAL. PER MIN.
TANKLESS HEATER CONTROL AT 185°F.
COLD WATER AT 80°F.
DRAW OFF RATE -
2 GAL. PER MIN.
3 GAL. PER MIN.
CYCLES REPEAT THEMSELVES NO LIMIT TO NUMBER
TIME IN MINUTES

Fig. 3—Graphic log — automatic washer tests

as long as the low limit control setting was above about 150 F. However, the variation in water temperature during any draw was appreciable. When the control was set at 165 F and the draw off rate was 3 gpm[2], the water temperature dropped from 185 F to 134 F, a drop of 50 F, between the start and finish of the draw representing the wash period of the cycle. A draw off rate of 2 gpm reduced this temperature drop to 40 F. Using supply water at 80 F rather than at 60 F did not appreciably affect the temperature of water drawn off when the draw off rate was 2 gpm, but at a draw off rate of 3 gpm it reduced the water temperature variation by approximately 5 to 10 F. The drop in temperature experienced with the tankless heaters would have been less had a fast acting water temperature control been used to start the burner as soon as possible after the start of a draw.

[2]A 5 gpm draw off rate was used in all tests on storage type heaters to be consistent with standard test procedures used by the *American Gas Association* and the *National Electrical Manufacturers' Association*. With tankless heaters the draw off rate must not exceed the rated capacity of the heater under test, hence draw off rates of 2 and 3 gpm were used with these heaters.

Journal Section

A summary of the effect of the control setting, the storage tank size, and the inlet water temperature on the maximum number of tubs of clothes which could be washed in succession is shown in Table 2. Since there is difference in opinion as to the minimum water temperature for washing clothes, the number of wash cycles that could be completed before the temperature of the water drawn dropped below both 125 F and 140 F are shown. For a given control

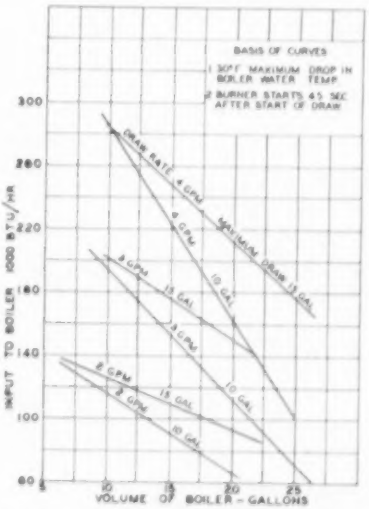


Fig. 4—Relationship between firing rate, water content of boiler, heater size, and maximum quantity of water drawn at one time, with 70 percent operating efficiency

setting, and when using 125 F as the minimum usable water temperature, it was possible to complete at least twice as many cycles when using the 66-gal tank as when using the 30-gal tank. However, the superiority of the 66-gal tank over the 30-gal tank was even more apparent when 140 F was taken as the minimum allowable water temperature. Here the mixing action between the hot and cold water that took place in the 30-gal tank limited the number of cycles to one, even at a control setting of 185 F, while with a 66-gal tank as many as four cycles were completed.

Table 2—Number of Washer Cycles Before Temperature of Water Drawn Dropped Below Indicated Minimum

Control Setting (F)	Cold Water Supply Temp (F)	Number of Washer Cycles			
		30-Gal Storage Tank		66-Gal Storage Tank	
		Min. Temp. of Water Drawn		Min. Temp. of Water Drawn	
		125 F	140 F	125 F	140 F
185	80	3	1	7	4
	60	2	1	5	3
165	80	2	1	5	3
	60	1	1	4	2
140	80	1	0	no test	no test
	60	1	0	2	1

Water Heating Loads

Storage Type Heaters: A previous publication[1] contains a discussion of water heating loads imposed on the boiler by indirect storage type heaters. That report indicated a maximum load of approximately 8000 Btuh for water usage of 75 gal per day when using an internal storage heater in conjunction with a 30-gal tank. This load was re-confirmed by the later test series, and, furthermore, it was found that the water heating load was essentially the same for both the external and internal storage heaters and for either the 30-gal or 66-gal storage tank.

Tankless Heater: In the case of the tankless heater, there was no water heating load during periods without hot water demand. However, the moment hot water was used, the load on the boiler was instantaneous and severe. There had to be sufficient heat available to raise the cold inlet water to the desired hot water temperature during the short period required for the water to circulate through the heater coil. Since the water circulated through the coil at the rate at which it was being drawn from the hot water tap, the load during the draw off sometimes exceeded 150,000 Btuh.

For a tankless water heater to operate suitably, the heat removed from the boiler during any draw off must not exceed the sum of the heat supplied to the boiler by the burner during the draw, the heat stored in the boiler water previous to the draw, and the heat stored in the metal of which the boiler is made. The latter is very small and may be neglected without serious consequence.

The heat stored in the boiler water may be expressed as:

$$H_w = W\ (t_1 - t_2) \quad \text{.....(1)}$$

where

H_w = heat stored in boiler water, in Btu.
W = weight of water in boiler, in pounds.
t_1 = temperature of water in boiler at start of draw.
t_2 = minimum temperature of water in boiler during draw.

The heat supplied by the burner would be:

$$H_b = h_f \times E \times F \times T \quad \text{.....(2)}$$

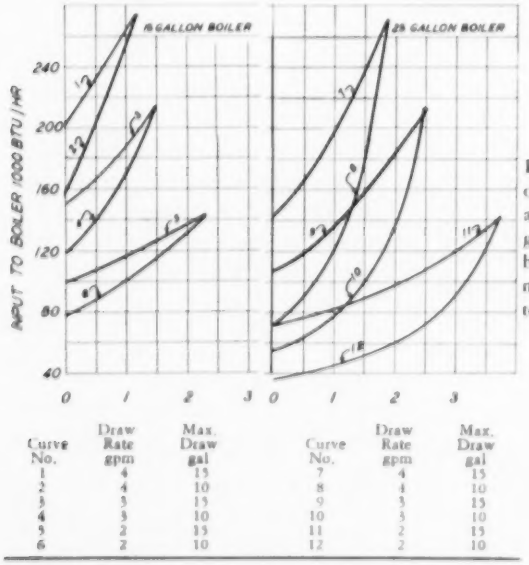
where

H_b = heat supplied by the burner, in Btu.
h_f = heat content of fuel in Btu per unit used (pounds, gallons, or cubic feet).
E = operating efficiency.
F = fuel burning rate in units used per hour.
T = time burner is in operation in hour.

The time the burner is in operation during any draw is equal to the total length of the draw off period minus the time delay before the low limit control starts the burner.

The curves of Fig. 4 were computed from the preceding equations, and show that the required heat input to the burner is increased by any one of the following changes: (1) An increase in heater size, (2) an increase in the quantity of water drawn, (3) a decrease in the water content of the boiler.

[1]Performance of an Indirect Storage Type Water Heater (University of Illinois Engineering *Experiment Station Bulletin* No. 366, pp. 35-37).



Curve No.	Draw Rate gpm	Max. Draw gal
1	4	15
2	4	10
3	3	15
4	3	10
5	2	15
6	2	10

Curve No.	Draw Rate gpm	Max. Draw gal
7	4	15
8	4	10
9	3	15
10	3	10
11	2	15
12	2	10

Fig. 5—Effect of time delay on minimum firing rate for a 15 gal boiler and a 25 gal boiler. All curves are based on 30 percent maximum drop in boiler water temperature

The curves of Fig. 5, also computed from Equations 1 and 2, show the importance of starting the burner operation as soon after the start of the draw as possible when using a tankless heater. This is especially true for boilers of small water content. The right hand end of each curve represents the maximum time delay that can be permitted regardless of the rate of heat input to the burner if the temperature drop of the water in the boiler is limited to 30 F.

Fig. 5 may be used in selecting the proper combination of boiler, burner, and water heater to meet a given requirement. To illustrate: Determine the minimum firing rate for the following conditions:

1. Heater size — 3 gal. per min.
2. Water content of boiler — 25 gal.
3. Burner starts 1 min. after start of draw.
4. Maximum single draw — 10 gal.

Curve 10, Fig. 5, shows that the minimum heat input rate should be 77,000 Btu per hr for the stated conditions.

Had the water content of the boiler been 15 gal, the minimum heat input rate would have had to be 168,000 Btu per hr (curve 4). Reducing the time delay from one min. to ½ min. would reduce the minimum heat input rates to 63,000 and 138,000 Btu per hr, respectively.

Fuel Consumption

Winter Operation: During the winter the main load on the boiler was the house heating load, and a large portion of the heat escaping from the surfaces of the boiler, the chimney, the storage tank, and the piping (which was lost heat as far as summer operation was concerned) was used in supplying heat to the house. Accordingly, several series of tests were run to determine the portion of the winter fuel consumption actually chargeable to heating water under various conditions of operation. Test conditions and resulting data are plotted in Fig. 6. In all cases *DRAW* means *gallons of domestic hot water per day*, and *OUTLET* means *temperature setting of low limit control.*

Since curve 1 fits all test points equally well, it was concluded that the total daily fuel consumption for winter operation was dependent upon the indoor-outdoor temperature difference, but, within the scope of the tests, was independent of the type of water heater used, the size of the storage tank, the setting of the low limit control, the temperature of the cold water, and the quantity of hot water used.

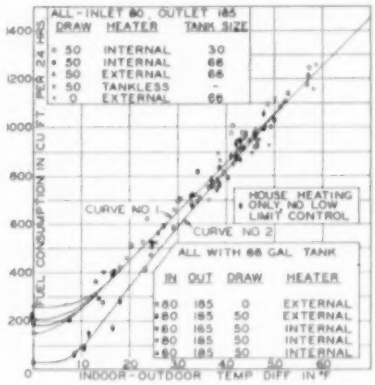

ALL - INLET 60, OUTLET 185
DRAW HEATER TANK SIZE
50 INTERNAL 30
50 INTERNAL 66
50 EXTERNAL 66
50 TANKLESS -
0 EXTERNAL 66
FUEL CONSUMPTION IN CU FT PER 24 HRS
HOUSE HEATING ONLY NO LOW LIMIT CONTROL
CURVE NO. 1
CURVE NO. 2
ALL WITH 66 GAL. TANK
IN OUT DRAW HEATER
180 185 0 EXTERNAL
180 185 50 EXTERNAL
180 185 50 INTERNAL
180 185 50 INTERNAL
180 185 50 INTERNAL
INDOOR-OUTDOOR TEMP DIFF IN °F

Fig. 6—Burner performance curves for heating domestic hot water with gas-fired boiler, winter operation

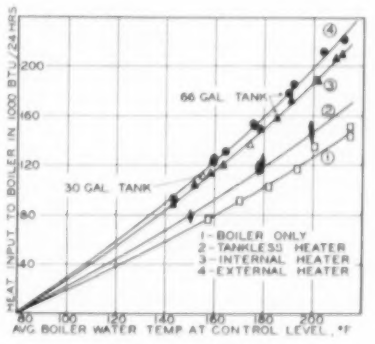

HEAT INPUT TO BOILER IN 1000 BTU/24 HRS
66 GAL. TANK
30 GAL. TANK
1 - BOILER ONLY
2 - TANKLESS HEATER
3 - INTERNAL HEATER
4 - EXTERNAL HEATER
AVG BOILER WATER TEMP AT CONTROL LEVEL, °F

Fig. 7—Standby heat input curves for summer (basement air temperature at ceiling approximately 80 F)

Curve 1 in Fig. 6 gives no clue as to what portion of the daily fuel consumption was chargeable to house heating and what portion to the heating of water. In test Series BA-47 (black diamond symbol in Fig. 6) no water heater was attached to the boiler and the low limit control and flow control valve were not used; therefore, all of the fuel consumption was chargeable to house heating as this was the only function performed by the boiler. Since the curve for Series BA-47 (curve 2, Fig. 6) represents daily fuel consumption for house heating only, and curve 1 represents daily fuel consumption for both house heating and domestic hot water, the difference between these two curves must represent the daily fuel consumption chargeable to water heating for winter operation.

The two curves shown in Fig. 6 differ from one another during mild winter days because at these times the low limit control was dominant over the room thermostat in controlling the boiler water temperature. Any increase in boiler water temperature by action of the low limit control over the water temperature needed to heat the house meant increased burner operation and increased wasted heat from the boiler and chimney. Where no low limit control was used, as Series BA-47, the water in the boiler was permitted to cool during times when there was no heat demand from the room thermostat. This resulted in a decrease in fuel consumption compared to operation where the boiler water temperature was maintained above a set minimum. As the outdoor temperature got colder, the room thermostat, rather than the low limit control, gradually became the controlling factor in determining the amount of burner operation and the temperature of the water in the boiler. The gas consumption then was identical for all methods of operation.

Summer Operation, Standby: In summer the only function of the boiler was to supply heat for domestic water heating, and, therefore, all fuel consumption was chargeable to the cost of providing hot water. Fig. 7 shows the gas consumption chargeable to the three types of heaters and to the boiler alone for periods during which no hot water was drawn off. The difference between curve 1 and the other curves represents the fuel consumption chargeable to the heat losses of the dif-

ferent heaters, connecting piping, and, when used, the storage tank. With an average boiler water temperature of 180 F at the control level, 15 cu ft of gas per day were required to offset the heat loss from the external tankless heater and piping; 46 cu ft for the internal heater, piping, and storage tank; and 56 cu ft for the external heater, piping, and storage tank. The heat losses of the 30- and the 66-gal tanks were so near equal that no significant difference in fuel consumption was noted between them.

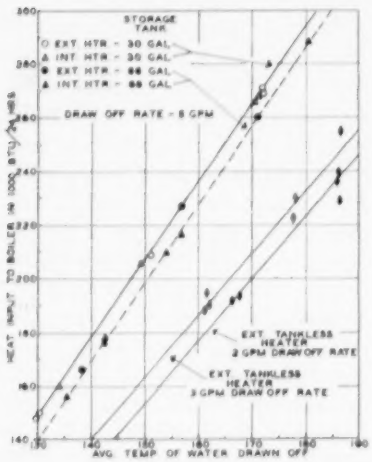

STORAGE TANK
EXT. HTR - 30 GAL.
INT. HTR - 30 GAL.
EXT. HTR - 66 GAL.
INT. HTR - 66 GAL.
DRAW OFF RATE - 5 GPM
EXT. TANKLESS HEATER 2 GPM DRAWOFF RATE
EXT. TANKLESS HEATER 5 GPM DRAWOFF RATE
HEAT INPUT TO BOILER IN 1000 BTU/24 HRS
AVG. TEMP OF WATER DRAWN OFF

Fig. 8—Daily heat input — storage type and tankless heaters (for summer operation with 75 gal of hot water used per day, cold water supply temperature 80 F, and basement air temperature at ceiling approximately 80 F)

For the combinations of boiler and heaters tested, the standby fuel consumption when using the external tankless heater was 22 to 26 percent less than when using either storage type heater, so it is apparent that, even though insulated, the heat loss of the storage tank caused an appreciable increase in the standby fuel consumption. Since domestic water heating systems operate at standby a large percentage of the total time, the tankless heater is inherently the more economical to operate and at the same time it releases less unwanted heat into the house during the warm summer months.

Summer Operation, 75-Gal Service Draw Off: The daily fuel requirements for each of the heaters when hot water was used in accordance with schedule C, Table 3, is shown in Fig. 8. The draw off rate when using storage type heaters was 5 gpm, while both 2 and 3 gpm draw off rates were used with the tankless heater.

Fig. 8 shows that both internal and external storage type heaters required the same heat input for the same storage tank size and operating conditions. However, for a given hot water temperature, the heat requirement of either heater used in conjunction with the 30-gal storage tank was about 8000 Btu per day higher than when used in conjunction with the 66-gal tank. The 30-gal storage capacity was not adequate to provide for a 75-gal service draw off, and, to compensate for the lack of storage capacity, it was necessary to increase the boiler water temperature. This increased the heat losses from the system which, in turn, increased the required heat input. These observations point to the desirability of providing adequate water storage

Table 3—Hot Water Draw Off Schedules

Schedule	A	B	C
Time of Day	Water Drawn Off, lb		
8:00 a.m.	17	83	83
9:00 a.m.	42	58	83
10:00 a.m.	33	25	100
11:00 a.m.	17	25	42
12:00 noon	17	25	42
2:00 p.m.	17	42	83
5:00 p.m.	17	17	25
7:00 p.m.	17	25	42
8:00 p.m.	25	33	42
9:00 p.m.	50	83	83
Total lb	252	416	625
Total gal	30	50	75

Start of draw off test — at end of burner on-period

End of draw off test — at end of last burner on-period approximately 24 hr after start of test.

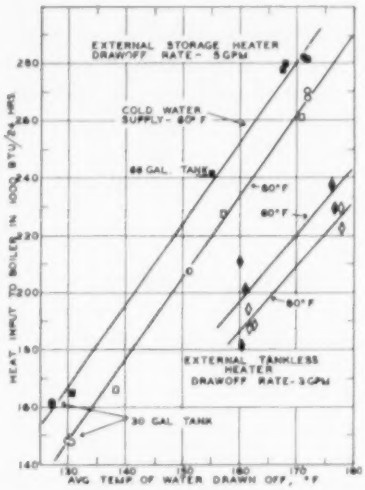

EXTERNAL STORAGE HEATER DRAWOFF RATE - 5 GPM
COLD WATER SUPPLY - 80° F
66 GAL. TANK
80°F
60°F
80°F
EXTERNAL TANKLESS HEATER DRAWOFF RATE - 5 GPM
30 GAL. TANK
HEAT INPUT TO BOILER IN 1000 BTU/24 HRS
AVG. TEMP OF WATER DRAWN OFF, °F

Fig. 9—Effect of cold water supply temperature on daily gas consumption. (chart based on 75 gal of hot water used per day, and for summer operation with basement air temperature at ceiling approximately 80 F)

Table 4—Distribution of Average Outdoor Temperatures and Corresponding Fuel Consumption Chargeable to Heating Water

Average Outdoor Temperature	Total No. of Days[a]	Average No. of Days Per Year	Gas Required to Heat 50 Gal of Water Daily (cu ft) Water Drawn = 140 F; Cold Water = 60 F			
			Storage Heater		Tankless Heater	
			Per Day	Total	Per Day	Total
−10 to −5	1	0.2	0	0	0	0
−5 to 0	2	0.4	0	0	0	0
0 to 5	4	0.8	0	0	0	0
5 to 10	11	2.2	0	0	0	0
10 to 15	23	4.6	0	0	0	0
15 to 20	38	7.6	0	0	0	0
20 to 25	68	13.6	0	0	0	0
25 to 30	127	25.4	0	0	0	0
30 to 35	169	33.8	20	680	20	680
35 to 40	150	30.0	35	1,050	35	1,050
40 to 45	117	23.4	50	1,170	50	1,170
45 to 50	113	22.6	65	1,470	65	1,470
50 to 55	104	20.8	80	1,660	80	1,660
55 to 60	99	19.8	100	1,980	90	1,780
60 to 65	110	22.0	110	2,420	90	1,980
65 to 70	95	19.0	130	2,470	90	1,710
70 to 75	68	13.6	130	1,770	90	1,220
75 to 80	47	9.4	130	1,220	90	850
80 to 85	17	3.4	130	440	90	500
85 to 90	2	0.4	130	50	90	40
Winter Total		273.0		16,380		13,910
Summer Total		92.0		15,180		11,500
Yearly Total			165 (Storage)	31,560 cu ft	125 (Tankless)	25,410 cu ft

[a]Based on records of United States Weather Bureau Station at the University of Illinois. Includes months of January, February, March, April, May, September, October, November, and December from September 1936 through May 1941.

capacity when storage type heaters are used.

The required heat input when using the tankless water heater was 40,000 to 60,000 Btu per day less than that required when using storage type heaters under the same general operating conditions. Over the whole range of water temperatures included in the tests on tankless heaters, reducing the draw off rate from 3 gpm to 2 gpm effected a reduction of about 8000 Btu per day in the heat input.

Fig. 9 shows that reducing the temperature of the cold water supplied to the system from 80 F to 60 F increased the required heat input for the storage type heaters by 20,000 Btu per day, or about 7 percent, and for the tankless heater by 11,000 Btu per day, or 5.8 percent.

Tests were made to determine the daily fuel consumption when supplying 30 and 50 gal of hot water daily (schedules A and B, Table 3). For brevity, a discussion of these tests is not included in this paper, but will be included in the more detailed report of water heater performance tests now being prepared for publication as a University of Illinois Engineering Experiment Station Bulletin.

Effect of Water Usage on Required Heat Input, Summer Operation: The curves of Fig. 10 were derived from Figs. 7, 8, and 9 and similar fuel consumption data for water usages of 30 and 50 gal per day. Since, for a given water temperature, the difference in the required heat input for the external and internal storage heaters with either the 30- or 66-gal storage tank was very small, only one set of curves for each water temperature is given. The values of these curves represent average heat inputs, for the two heaters and the two sizes of storage tanks tested.

Fig. 10 shows that for summer operation the tankless heater is much more efficient than the storage type heaters. In fact, the required heat input for the tankless heater was from 20 to 25 percent less than for the storage heaters over the whole range of test conditions. Fig. 10 also shows that the standby losses (no water used) represent approximately 50 to 60 percent of the total heat requirements for summer operation.

Water Heating Costs

Yearly Cost of Heating Water: Because of the number of variables involved, it is not easy to determine the yearly cost of heating water with an indirect water heater. Some of the more important variables are: (1) type and size of heater; (2) average quantity of hot water used per day; (3) temperature of the hot water; (4) unit cost of fuel; and (5) method of control. For the types

Journal Section

of heaters and method of control used in the I=B=R Research Home, an estimate of the yearly cost of heating water was made based on the assumptions that the average family of four uses 50 gal of 140 F water per day and cold water is available at a temperature of 60 F. Since it is recognized that operating conditions vary widely, correction factors were determined for other water usage schedules and water temperatures.

The frequency of the different outdoor temperatures occurring during the nine months of a typical heating season in Urbana, Illinois, is shown in Table 4. The data are from records of the U. S. Weather Bureau Station at the University of Illinois for the five years from September 1936 to May 1941, inclusive.

Column 4 shows the estimated daily fuel consumption chargeable to heating 50 gal of water daily with the storage type heater for the assumed conditions. The values shown for the winter days represent the difference between the two curves on Fig. 6 corresponding to indoor-outdoor temperature differences represented by the mean temperature of each bracket shown in column 1.

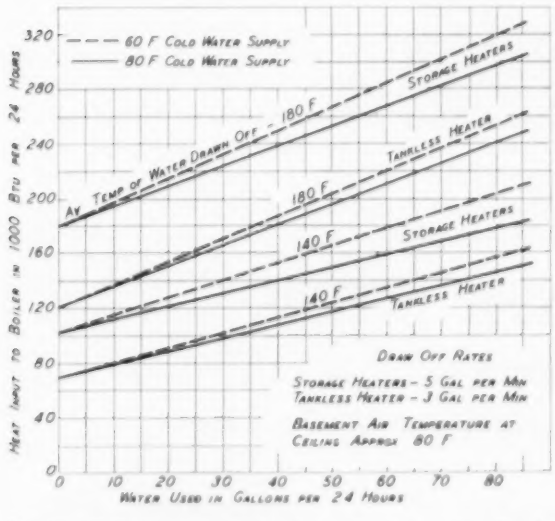

60 F Cold Water Supply
80 F Cold Water Supply
Storage Heaters
Tankless Heater
Av Temp of Water Drawn Off - 180 F
180 F
140 F
Storage Heaters
140 F
Tankless Heater
Draw Off Rates
Storage Heaters - 5 Gal per Min
Tankless Heater - 3 Gal per Min
Basement Air Temperature at Ceiling Approx 80 F
Heat Input to Boiler in 1000 Btu per 24 Hours
Water Used in Gallons per 24 Hours

Fig. 10—Daily gas consumption for summer operation. Based on service draw off tests

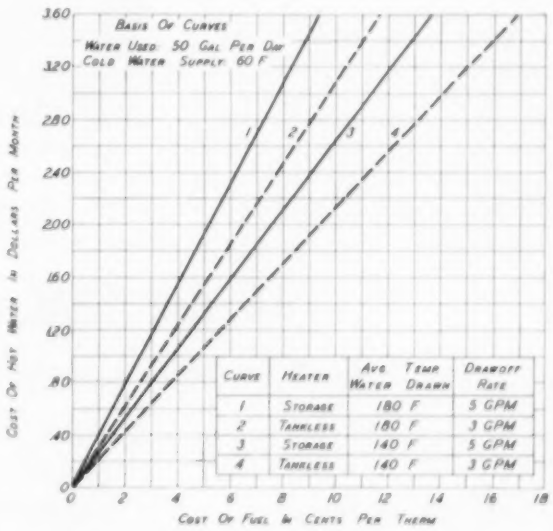

Basis Of Curves
Water Used 50 Gal Per Day
Cold Water Supply 60 F
Cost Of Hot Water in Dollars Per Month
Cost Of Fuel in Cents Per Therm
Curve | Heater | Av. Temp Water Drawn | Drawoff Rate
1 | Storage | 180 F | 5 GPM
2 | Tankless | 180 F | 3 GPM
3 | Storage | 140 F | 5 GPM
4 | Tankless | 140 F | 3 GPM

Fig. 11—Average monthly cost of heating water

The fuel consumptions shown in column 5 were calculated by multiplying the daily fuel consumptions (column 4) by the average number of days per year having an average temperature falling within the limits of each bracket (column 3). The winter total of column 5 represents an estimated gas consumption of 16,380 cu ft for the storage type heater during the nine months of the heating season.

During the three summer months, a daily fuel consumption of 165 cu ft can be estimated from Fig. 10. Since there are 92 days during the months of June, July and August, the total fuel consumption for the summer months would be 165 × 92 = 15,180 cu ft of gas. The yearly total for the storage type heaters under the conditions shown would be 16,380 + 15,180 = 31,560 cu ft of gas. At a cost of 6 cents per therm (1 therm = 100,000 Btu or 100 cu ft of the gas used in the tests) this estimated fuel consumption gives a total cost of $18.94 per year or an average cost of $1.58 per month.

Similar data are shown for the external tankless heater in columns 6 and 7 of Table 4. The total yearly fuel consumption of the tankless heater is shown as 25,410 cu ft. At a cost of 6 cents per therm, the yearly cost of this quantity of gas would be $15.25, or an average of $1.27 per month.

It will be noted in columns 4 and 6, Table 4, that for days during the heating season with outdoor temperatures high enough that no house heating was required, the daily fuel consumption charged to heating water was less than during the summer months. This was because the gas consumption of the pilot, amounting to about 35 cu ft per day, was charged to water heating during the summer. Since the principal function of the boiler during the heating season was to supply heat to the house, it seemed logical to charge the pilot fuel consumption to house heating during the heating season. However, had the gas consumption of the pilot been charged to water heating for all days for which the average temperature was 65 F or above, regardless of the month of the year, the additional cost of heating water based on gas at 6 cents per therm would have only $0.96 per year, or 8 cents per month.

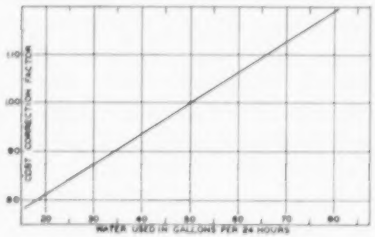


Fig. 12—Correction factor to obtain cost of heating water when usage is other than 50 gal per 24 hr.

The average monthly cost of heating water as described in the first part of this section was determined for several water usage schedules and hot water temperatures, and from these data Figs. 11 and 12 were drawn. Curves 1 and 2 of Fig. 11 are for a hot water temperature of 180 F, and curves 3 and 4 represent a hot water temperature of 140 F. Water temperatures between these values may be interpolated linearly between the appropriate curves.

In order to determine a cost correction factor for water usages other than 50 gal per day, the ratio of the fuel consumption for any given water usage and that for a daily water usage of 50 gal was obtained for each combination of heater, storage tank, and hot water temperature included in the test program. It was found that the curve of Fig. 12 represented all conditions within ± 6 percent, and, therefore, could be used to determine the multiplying factor to be applied to the costs obtained from the curves of Fig. 11 to correct them to water usages other than 50 gal per day.

Use of Figs. 11 and 12 can be illustrated by the following example: Determine the average cost of heating water for the following conditions:

Type of heater ..... External tankless
Hot Water Temperature ..... 180 F
Draw Off Rate ..... 3 gpm
Hot Water Usage ..... 75 gal per day
Fuel .... Natural Gas, 1000 Btu per cu ft
Cost of Fuel ..... 10 cents per therm (100,000 Btu)

On Fig. 11 find cost of gas, 10 cents per therm, on horizontal axis, go vertically upward until curve 2 (tankless heater, water temperature 180 F) is intersected, then horizontally to the left. The average monthly cost of supplying 50 gal of hot water per day is found to be $3.08. Since the quantity of hot water used was not 50 gal per day but 75 gal, Fig. 12 must be used to find the cost correction factor to be applied to the above value. For a daily usage of 75 gal the cost correction factor is 1.16. Therefore, the cost of heating water for the conditions stated is $3.08 × 1.16 = $3.57 per month.

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Heat Requirements of • • •

SNOW MELTING

• • • • Systems

This paper presents an extension of the general equations for snow melting systems. The extended theory is substantiated by experimental data and covers periods of no snowfall — *idling periods* — as well as actual operating periods. A Table is included for rapid use of the data over the usual design range.

By W. P. Chapman*
and Samuel Katunich†

A SNOW melting research project was initiated in 1952 at the National Tube Division, U. S. Steel, Research Laboratory for a dual purpose. First, to substantiate experimentally a proposed equation for operating heat requirements, and second, to determine the heat requirement of a system during the *idling* period prior to snowfall.

The proposed equation is base on the *free-area* concept[1], and includes the insulating effect of the un-melted snow. The *free area ratio* has been defined[1] as the ratio of the area *free* of snow to the total area. It may be assumed that any area even partially covered by snow would have an insulating effect provided by the unmelted snow. It may be said then, that the *free area ratio*, A_r, represents an insulating factor.

The proposed equation has been substantiated by experimental data and can be written as:

$$q_t = q_s + q_{sm} + A_r\,(q_e + q_h) \quad \ldots(1)$$

with symbols as defined in Nomenclature and with its derivation demonstrated in Appendix B. In Appendix B also it is shown that the value of A_r can be expressed as

$$A_r = [q_t - (q_s + q_m)]/[q_e - (q_s + q_m)] \quad \ldots\ldots\ldots\ldots\ldots(2)$$

The four heat requirements: (1) sensible heat gain of snow, q_s, (2) latent heat of fusion, q_m, (3) latent heat of evaporation, q_e, and (4) heat transfer, q_h, are equated in Appendix A and have been derived in the literature[1].

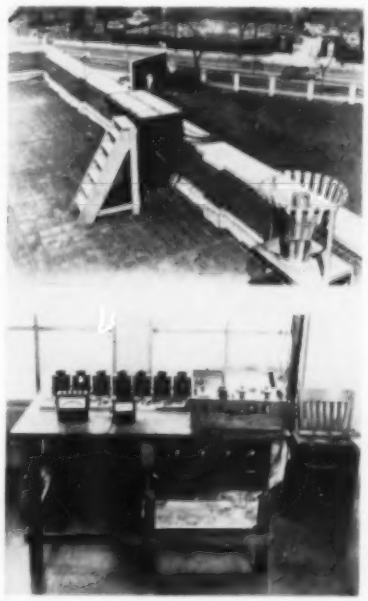

Fig. 1—(Top) The location of the panels and weather equipment. (Bottom) The power input and thermocouple controls

It may be shown that there are just 3 practical values for A_r, namely, zero, 0.5 and 1.0. When the free area ratio, A_r, is equal to zero, the slab is covered completely with snow. Although this condition can be defined as a failure of the system, it may be tolerable in some instances for short periods of time. Examples would be residential driveways or walks where time for clearance is not critical.

When the free area ratio, A_r, is equal to unity, the slab is completely free of snow. This condition requires the maximum energy supply to the slab. Such a design is warranted for emergency areas or any area where snow accumulation cannot be tolerated.

An intermediate value of A_r = 0.5 can be used for less critical areas, such as sidewalks around commercial buildings. It will be shown that a very light coverage of snow will develop a free area ratio of 0.5, but probably will not reduce traction significantly.

The second part of the research project dealt with the *idling* requirements of a snow melting system. Information was sought to answer the question of the heat required to maintain a slab surface temperature above freezing during periods of no snowfall. It was found that the convection losses in Btu per hr (sq ft) can be estimated by the equation:

$$q_h = (0.27\,v + 2.5)\,(t_p - t_a) \quad \ldots(3)$$

Since most systems are idled during overcast periods with air temperatures averaging between 20 and 25 F, it is felt that sufficient accuracy is obtained by using a radiation co-

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†Metallurgical Research Engineer, National Tube Division, United States Steel Corp., Pittsburgh, Pa.

For presentation at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Washington, D.C., June 1956.

[1]Design of Snow Melting Systems, by W. P. Chapman (*Heating and Ventilating*, April, 1952).

efficient of 0.8 in Btu per (hr) (sq ft), which gives an *idling* equation of

$$q_b = (0.27\ v + 3.3)(t_p - t_a) \quad \ldots (4)$$

This equation represents the convection and radiation transfer from a dry slab to an ambient temperature equal to the air temperature.

Description of Equipment

Two different types of snow melting panels were used. The first type, shown in Fig. 1, consisted of 10 one-foot square panels made up of insulated nichrome heating elements spaced on ¾ in. centers under ½ in. of cement mortar. The 10 panels were insulated from each other by 2 in. wood separators. Two-inch thick foam glass bricks at the sides and a 6-in. layer of fiber glass wool under the panels prevented excessive heat losses in those directions. A slope of ¼ in. per ft was provided to allow for water run-off. To protect the apparatus from water penetration, all electrical outlets and all insulating materials were waterproofed.

At least 2 copper-constantan thermocouples per panel were installed to measure panel surface temperatures. The thermocouple beads were thin copper rectangles 0.03 × 0.40 × 0.25 in. placed on a center line parallel and as close to the panel surface as possible without exposing them to the atmosphere. It was thought that having a plate as the hot junction would eliminate the effect of localized chilling. Ordinary thermocouples were used to measure insulation temperatures.

The second type of panel, shown in Fig. 2, was a round panel having an area of 10 sq ft. Its heating elements and insulation were similar to those of the square panels. This round panel was used primarily for the *idling* tests because of its uniform wind path length regardless of wind direction.

The power input to the panels was adjusted by the use of variable transformers. The power used was measured either by an ammeter-voltmeter setup or with a wattmeter. Provisions were made through a switchboard and potentiometer arrangement to read the 45 thermocouples used.

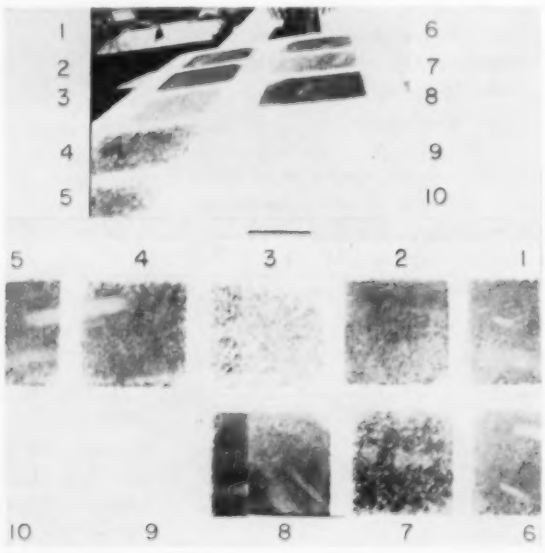
Weather instruments used consisted of a totalizing anemometer, a recording snow gage, and a sling psychrometer. The snow gage was supplemented by weighing snowfall collected in wide-mouthed containers. This was done when the snowfall was accompanied by gusty, high winds or when relatively little snowfall occurred. The dry bulb of the psy-

Nomenclature

A_f = free area ratio.
f_c = film coefficient of heat transfer for convection, Btu per (hour) (square foot) (Fahrenheit degree).
f_r = film coefficient of heat transfer for radiation, Btu per (hour) (square foot) (Fahrenheit degree).
h_{fs} = enthalpy of saturated vapor at film temperature, Btu per pound.
P_{av} = vapor pressure of moist air, inches of mercury.
P_{wv} = vapor pressure of water, inches of mercury.
q_b = heat transfer from a bare panel (idling conditions) Btu per (hour) (square foot).
q_{bc} = heat transfer by convection from a bare panel, Btu per (hour) (square foot).
q_e = heat of vaporization, Btu per (hour) (square foot).
q_h = heat transferred by convection and radiation, Btu per (hour) (square foot).
q_i = total heat input, Btu per (hour) (square foot).
q_l = heat loss through insulation (edge and bottom losses in terms of panel area), Btu per (hour) (square foot).
q_m = heat of fusion, Btu per (hour) (square foot).
q_o = $q_e + q_m + q_s + q_h$, Btu per (hour) (square foot).
q_s = sensible heat gain of snow, Btu per (hour) (square foot).
q_t = total heat output, Btu per (hour) (square foot).
s = rate of snowfall, inches of water equivalent per hour (the unit, inches of water equivalent per hour, is defined as the depth of water that would be obtained if the snowfall per hour were melted).
t = temperature of the circulated fluid for anti-freeze solution.
t_a = air temperature, Fahrenheit.
T_a = air temperature, Fahrenheit absolute.
t_p = panel surface temperature, Fahrenheit.
T_p = panel surface temperature, Fahrenheit absolute.
t_f = water film temperature, Fahrenheit.
v = wind velocity, miles per hour.

Fig. 2—A view of the round panel of 10 square feet area —location approximately 15 ft left of the panels shown in Fig. 1

Fig. 3—Photographs of the panels under equilibrium conditions when insulation effect of snow was being considered. (Top) Side view. (Bottom) Top view



chrometer was kept free of snowflakes by enclosing it within a perforated metal sleeve.

Test Procedure

In running the tests to determine the effect of snow insulation, the power input to the panels was varied so that different thicknesses of snow were maintained upon the panels under equilibrium conditions. Wind velocity readings and photographs of the panels were taken at the beginning and end of each chosen interval. Snowfall was measured by a recording snow gage and also by weighing the amount collected in wide-mouthed containers. Relative humidity of the atmosphere was ascertained by the use of a sling psychrometer at frequent intervals during the test.

On days when no snowfall occurred, a study of the system's idling requirements was made. Under equilibrium conditions, such as would very nearly exist after the system was idling a short time, convection and radiation losses account for all heat input except small heat losses through the insulating materials. Because of the small temperature differences involved in the idling tests, these insulation losses were considered negligible.

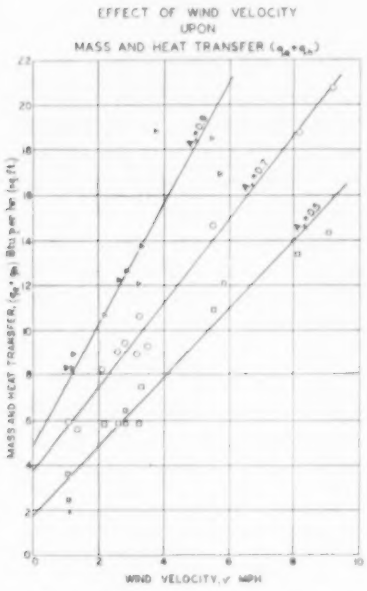


Fig. 4—Effect of wind velocity upon mass and heat transfer ($q_e + q_h$)

To account for the radiation exchange with the atmosphere, the idling tests were made under conditions where the unheated panel surface temperature was equal to or less than the air temperature. When t_p was less than t_a, one of the 10 panels was supplied with enough energy to raise its temperature to air temperature. This quantity of energy was then subtracted from the total energy supplied to the other panels. This energy difference represents the convection between the heated panels and the air, and is defined as the convection requirement.

Table 1—Values of Radiation Coefficient, f_r, at Usual Air Temperatures

Air Temperature, t_a	Radiation Coefficient*, f_r, Btu per hr (sq ft) (F deg)
30	0.819
25	0.807
20	0.795
15	0.782

*For a panel surface temperature of t_p = 32 F.

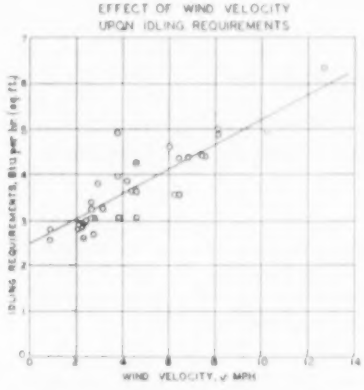


Fig. 5—Effect of wind velocity upon idling requirements

Results

Of the four heat requirements, vaporization (q_e), convection and radiation (q_h), sensible heat of snow (q_s), and the heat of fusion of snow (q_m), a saving can be realized only upon the heat requirements for vaporization, convection, and radiation. Regardless of any snow insulation effect, all the snow must be raised to a temperature of about 32 F and

Table 2—Heat Output and Fluid Temperatures for Snow Melting Systems

Relative Humidity, Percent	Rate of Snowfall, Inches of Water Equivalent Per Hour	Free Area Ratio* A_r		t_a Air Temperature, Fahrenheit: 0 — v Wind Velocity, mph: 5	10	15	20 — 5	10	15	30 — 5	10	15	40 — 5	10	15
75	0.08	1.0	q_t[b]	151	206	260	128	169	210	103	129	156	76	87	97
			t	108	135	163	97	118	138	85	98	111	71	76	81
		0.0	q_t	66	66	66	64	64	64	62	62	62	60	60	60
			t	66	66	66	65	65	65	64	64	64	63	63	63
	0.16	1.0	q_t	218	273	327	193	234	275	166	192	219	136	147	157
			t	142	169	197	129	150	170	117	130	145	101	106	111
		0.0	q_t	133	133	133	129	129	129	125	125	125	121	121	121
			t	99	99	99	97	97	97	95	95	95	93	93	93
	0.25	1.0	q_t	293	347	402	265	306	347	236	262	289	204	214	224
			t	179	207	234	166	186	207	151	164	177	135	140	145
		0.0	q_t	208	208	208	202	202	202	195	195	195	188	188	188
			t	137	137	137	134	134	134	131	131	131	127	127	127
90	0.08	1.0	q_t	150	204	258	126	167	208	100	125	150	72	80	87
			t	108	135	162	96	116	136	84	96	109	69	72	76
		0.0	q_t	66	66	66	64	64	64	62	62	62	60	60	60
			t	66	66	66	65	65	65	64	64	64	63	63	63
	0.16	1.0	q_t	217	271	325	191	232	275	163	188	213	132	140	147
			t	142	169	198	128	148	168	116	128	141	99	102	106
		0.0	q_t	133	133	133	129	129	129	125	125	125	121	121	121
			t	99	99	99	97	97	97	95	95	95	93	93	93
	0.25	1.0	q_t	291	346	400	264	304	344	235	258	283	200	208	215
			t	179	206	233	165	185	205	150	162	175	133	137	141
		0.0	q_t	208	208	208	202	202	202	195	195	195	188	188	188
			t	137	137	137	134	134	134	131	131	131	127	127	127

*Free Area Ratio, A_r = snow-free area ÷ total area.
[b] q_t = heat output, Btu per (hour) (square foot); t = fluid temperature, Fahrenheit (based on ¾-in. pipe on 12-in. centers with 2-in. concrete cover.)

then melted. Stated algebraically, this is Equation 1, *viz*:—

$$q_t = q_s + q_m + A_r\,(q_c + q_b)$$

Analysis of the experimental data for one test, as shown by the sample calculation in Appendix C, gives $A_r = 0.54$. A photograph of how a panel looks with a free area ratio of 0.54 is given in panel 5 of Fig. 3.

Examination of photographs of each test indicates that for all practical purposes, the only intermediate value of A_r that is significant is $A_r = 0.5$.

Results of 34 tests are plotted in Fig. 4 and lines of constant values of A_r have been fitted to the points by the method of least squares.

The other phase of the project concerned the *ilding* or *warming-up* heat requirements prior to a predicted snowfall. During this period, all heat transfer from the slab surface is by radiation or convection. It was initially assumed that idling requirements could be expressed in an exponential equation which would include as variables both the wind velocity and the difference in air and panel temperature. However, the tests made indicate that within the range of atmospheric conditions during each test run, the wind velocity and air temperature can be included in a *linear* equation to represent the idling requirements.

This linear equation (in Btu per hour per square foot) is of the form:

$$q_b = (f_c + f_r)(t_p - t_a) \quad \ldots\ldots\ldots(5)$$

CONCLUSIONS

Data obtained as a result of this investigation and the observations made while performing the snow melting operation indicate the following conclusions:

1. If a slight amount of snow is allowed to accumulate upon a snow melting panel, there is an insulation effect dependent upon the existing wind velocity, relative humidity, and air temperature. Conditions of a high wind velocity and a low air temperature offer the greatest heat savings potential. Relative humidity is the least important.

2. An A_r of 0.5 results in considerable heat saving and involves a snow covering that could be tolerated in many non-critical installations. An A_r of less than 0.5, possibly one of zero, would not be justified unless snow accumulation were acceptable for short periods of time.

3. To calculate approximate heat requirements to pre-warm a system, Equation 4 can be used if the wind velocity is not greater than 12 mph.

4. The basic Equation for a snow melting system can be taken as Equation 1.

5. Table 2 can be used to determine the basic design requirements for snow melting systems over the usual design range.

The coefficient for radiation, f_r, can be taken as

$$f_r = 0.173\,[(T_p/100)^4 - (T_a/100)^4]/(t_p - t_a) \quad \ldots\ldots\ldots(6)\dagger$$

Several solutions of Equation 6 are given in Table 1.

From Table 1 it can be seen that $f_r = 0.8$ is a sufficiently accurate assumption for usual air temperatures.

Fig. 5 is a plot of the experimental data for the convection coefficient, f_c. The slope and intercept of the line of best fit (fitted by the method of least squares) in Fig. 5 gives the coefficient a value of

$$f_c = 0.27\,v + 2.5$$

†In Equation 6, T_a and t_a are used as if they were the *equivalent receiver temperature* which is the weighted average temperature including various surface temperatures and *sky* temperature, such that if the snow-melting panel were enclosed by an isothermal hood, with shape and emissivity factors of unity, the radiation exchange would be the same as that found in the field. This use of T_a and t_a is within the accuracy of the paper.

The values of f_r and f_c can then be substituted in Equation 5 as follows:

$$q_b = (f_c + f_r)(t_p - t_a)$$
$$q_b = (0.27v + 2.5 + 0.8)(t_p - t_a)$$
$$q_b = (0.27v + 3.3)(t_p - t_a)$$

and becomes Equation 4, evaluated for practical use, as the output for a dry, bare slab, or the heat requirement for an idling period.

Table for Practical Use

In order to simplify the application of the data, Table 2 has been prepared. It may be used directly to determine the heat outputs and fluid temperatures needed for the usual ranges of air temperature, wind velocity, relative humidity, and snowfall rates for slabs designed to be completely free of snow, ($A_r = 1$) and completely covered, ($A_r = 0$). It may also be used to determine the heat required for the intermediate case when $A_r = 0.5$. This use is illustrated by the following procedure.

Problem: Find the heat requirement of an installation when the snowfall rate is 0.16 ($s = 0.16$); *the air temperature,* t_a, *is* 10 *F; the wind velocity,* v *is* 10 *mph, the relative humidity is* 75 *percent; and where a partially free surface can be tolerated* ($A_r = 0.5$).

Solution: From Table 2 note that for the stated conditions the value of q_t for $A_r = 1.0$ is 234 Btu per (hr) (sq ft). Also that for $A_r = 0$, the value of q_t is 129 Btu per (hr) (sq ft). For the intermediate value of $A_r = 0.5$, the requirement is

$$0.5\,(234 + 129) = 181 \text{ Btu per (hr) (sq ft)}.$$

APPENDIX A

Basic Equations for Calculating Heat Requirements

The following 5 equations are those used in calculating the various heat quantities which are needed in arriving at the total heat requirement.

Heat of Vaporization, q_v: This quantity can be found from the expression:

$$q_v = (av + b)(P_{wv} - P_{av})h_{fg} \quad \ldots\ldots\ldots(A\text{-}1)$$

where

$$a = 0.0201$$
$$b = 0.055$$

Sensible Heat Gain of Snow, q_s: Use of the following expression yields the sensible heat quantity:

$$q_s = 2.6\ (t_f - t_a)s \quad \ldots\ldots\ldots (A\text{-}2)$$

Heat of Fusion of Snow, q_m: can be calculated from the expression

$$q_m = 746s \quad \ldots\ldots\ldots\ldots\ldots\ldots (A\text{-}3)$$

Heat Transferred by Convection and Radiation, q_b: This quantity is determined by applying the expression:

$$q_b = 11.4\ (av + b)\ (t_f - t_a) \quad (A\text{-}4)$$

where

$a = 0.0201$
$b = 0.055$

Equations A-1, A-2, A-3, and A-4 are derived in Reference 1, and all are expressed in the units stated in the Nomenclature.

Total Heat Requirements, q_t: This is the quantity found by Equation 1 of this paper, *viz*:

$$q_t = q_s + q_m + A_r(q_s + q_b) \quad \ldots (1)$$

and which is derived in Appendix B.

APPENDIX B

Derivation of Equations 1 and 2

Definitions: It is necessary first to set up definitions of the terms used. First, let

A_f = area *free* of snow, in square feet so that the total output from the *free* part of the panel would be: $q_o = q_s + q_b + q_m + q_s$

Then as a second definition, let

A_c = area *covered* by snow, in square feet so that the total output from the *covered* part of the panel would be $q_s + q_m$. Also let $A_t = A_f + A_c$, and further let $A_r = A_f/A_t$ = *free area* ratio.

Since

$$A_t = A_f + A_c,$$

then

$$1 = (A_f/A_t) + (A_c/A_t) = A_r + (A_c/A_t)$$

and

$$A_c/A_t = 1 - A_r$$

Derivation: From test data

$q_t = q_t - q_t$ = total heat *output* per unit area.

Hence,

A_tq_t = total heat output from entire panel.

But from the definitions

$A_fq_o + A_c(q_s + q_m)$ = total heat output from the panel.

Therefore

$$A_tq_t = A_fq_o + A_c(q_s + q_m)$$

Dividing by A_t

$$q_t = A_fq_o + (1 - A_r)(q_s + q_m)$$

and

$$A_r = [q_t - (q_s + q_m)]/[q_o - (q_s + q_m)],$$ which is Equation 2 in the text.

Limits: There are three limiting cases which need to be considered, *viz.*:
Case I, when $A_r = 1$, and surface is wholly free of snow.
Then

$$q_t = q_o = q_s + q_b + q_m + q_s$$

and

$$A_f = A_t$$

This can be checked by noting that:

$$1 = [q_o - (q_s + q_m)]/[q_o - (q_s + q_m)] = 1$$

Case II, when $A_r = 0$, and surface is wholly covered by snow.
Then

$$q_t = q_s + q_m$$

and

$$A_c = A_t$$

This case can be checked by noting that:

$$0 = [q_s + q_m - (q_s + q_m)]/[q_s - (q_s + q_m)]$$

Case III, when A_r lies between the values of 1.0 and zero, and the surface is partially covered by snow.
Then

$$q_t = q_s + q_m + A_r(q_s + q_b)$$

In this case the value of A_r is:

$[q_t - (q_s + q_m)]/[q_o - (q_s + q_m)]$

$A_r\ [q_o - (q_s + q_m)] = q_t - (q_s + q_m)$

but

$q_o = q_s + q_b + q_s + q_m$, so $q_o - (q_s + q_m) = q_s + q_b$

Then

$$q_t = q_s + q_m + A_r\ (q_s + q_b),$$

which checks and is Equation 1 in the text.

APPENDIX C

Sample Calculations for Applying Basic Equations of Appendix A to Experimental Data to Determine A_r

The calculations are based upon the assumption that equilibrium conditions exist, that the snow is at air temperature, and that the snow forms a 0.01 ft film of water when it melts.

Problem: Determine the value of A_r for the case of the panel 5 as illustrated in Fig. 3, where the snow is partially melted, and which produced the following *experimental* data: $t_p = 34.2$; $t_a = 29.2$; $s = 0.048$; $v = 2.1$ mph; relative humidity = 88 percent (so $P_{av} = 0.142$); $q_t = 43.7$, and $q_s = 1.42$. At 34.2 F, $P_{av} = 0.193$, and $h_{fg} = 1073.9$.

Calculations: As a first step, find the *heat of vaporization* by substituting the experimental data in Equation A-1 as follows:

$$q_e = (av + b)\ (P_{av} - P_{av})h_{fg}$$
$$= (0.0201 \times 2.1 + 0.055)\ (0.193 - 0.142)\ 1073.9$$
$$= 5.32 \text{ Btu per (hr) (sq ft)}$$

Second, determine the *sensible heat gain of the snow* by substitution in Equation A-2, thus:

$$q_s = 2.6s\ (t_f - t_a), \text{ with } t_f \text{ equal to } t_p$$
$$= 2.6 \times 0.048\ (34.2 - 29.2)$$
$$= 0.62 \text{ Btu per (hr) (sq ft)}$$

Then, apply Equation A-3 and find the *heat of fusion of snow* to be:

$$q_m = 746s$$
$$= 746 \times 0.048$$
$$= 35.8 \text{ Btu per (hr) (sq ft)}$$

Fourth, by substituting in Equation A-4 evaluate the *Heat Transfer by Radiation and Convection, viz.*:

$$q_b = 11.4\ (av + b)\ (t_f - t_a)$$
$$= 11.4\ (0.0201 \times 2.1 + 0.055)\ (34.2 - 29.2)$$
$$= 5.53 \text{ Btu per (hr) (sq ft)}$$

Now keep in mind that the total heat *output*, q_t, per unit area from the test data is $q_t = q_t = 43.7 - 1.42 = 42.3$, and the free area ratio, A_r, can be evaluated from

$$A_r = [q_t - (q_s + q_m)]/[q_o - (q_s + q_m)] = [q_t - (q_s + q_m)]/(q_s + q_b)$$

by substituting the several values as follows:

$$A_r = [42.3 - (0.62 + 35.8)]/(5.32 + 5.53) = 0.54$$

1955 ANNUAL REPORT OF COMMITTEE ON RESEARCH

By B. H. Jennings, Chairman, and E. R. Kaiser, Director of Research

Chairman Jennings

John Everetts, Jr., Vice Chairman

Three Years: R. C. Chewning, W. S. Harris, N. B. Hutcheon, B. H. Jennings, R. A. Miller.

Two Years: John Everetts, Jr., W. F. Friend, Carl F. Kayan, H. B. Limbacher, E. F. Snyder, Jr.

One Year: R. S. Dill, F. H. Faust, F. K. Hick, M.D., H. A. Lockhart, J. W. McElgin.

Director Kaiser

CONTINUED growth and expansion of the research program of the Society took place during the fiscal year, November 1, 1954 to October 31, 1955. Ten projects at the Laboratory in Cleveland, and 15 projects at cooperating university and industrial laboratories were supported during the year. Seventeen technical papers along with the preparation of new and revised data for the HEATING, VENTILATING, AIR CONDITIONING GUIDE resulted from the work. Nine research projects were completed during the year.

Committee activity reached a new high as 5 meetings of the Committee on Research and the Research Executive Committee; 26 meetings of the 23 Technical Advisory Committees, and several subcommittee meetings were held. These TA Committees served the Society and industry in numerous ways by recommending projects, discussing progress and plans, and by reviewing manuscripts before publication. More than 250 engineers and industrialists thus contributed to the research program, and some of their activities are reported here in detail under appropriate TAC listings.

Expenditures and Finances

Research expenditures totalled $205,000, an increase of 33 percent over 1954. Research income met expenses by virtue of a 43-percent increase in the number of industrial contributors, by increased membership dues, and from the larger revenue which accrued from the biennial exposition sponsored by the Society. The supporting companies, consultants and trade associations who contribute funds and equipment on an annual basis totalled 190 during 1955.

The outlook for 1956 research is optimistic, because of good business

Fig. 1—Sources of Society research funds — 1955

conditions and a broadening realization of the benefits of ASHAE research to industry. Several new projects that should attract additional industrial support are under consideration at the year's end, while all of the continuing projects also enjoy a strong interest among the membership and industry.

Participation in the programs is invited by the Committee on Research. With the assistance of the staff and committees, the director of research extends current programs and prepares new programs in cooperation with interested groups. Cost estimates and finances are arranged, and the work is conducted at the Society's Laboratory or at cooperating institutions on a non-profit basis.

Air Cleaning

The project on air contaminants at the University of Minnesota has been continued by K. T. Whitby under the direction of A. B. Algren. Accomplishments include the completion of a centrifugal sedimentation apparatus and a usable procedure for determining the size ranges and amounts of particulate matter in dust samples. A mixture of subsieve particles from 100 microns down to 0.05 microns can be classified rapidly in one operation in the apparatus. The tool will be useful to researchers and manufacturers of air-cleaning equipment.

Suitable filters for atmospheric dust and lint have been developed and reported. An apparatus and method for studying dusts photometrically has also been evolved and the limitations of such methods have been established.

The project has been pursued vigorously to unravel the problems of dust agglomeration and measurement. Development of accurate methods of evaluating air-cleaning equipment is a prime objective.

A seminar on air cleaning was held at the University in March, and several other meetings were also held in which manufacturers of air filters participated.

Air Distribution

Five projects on air flow and distribution in air conditioning were in progress, two of which were completed and four publications resulted.

Case Institute of Technology: G. L. Tuye and Alfred Koestel completed a paper on an extensive investigation of the performance of 5 room-air distribution systems having grilles at various levels and locations. The flow patterns in the room and the temperature distributions were plotted to show practical effects. The results are useful to the heating industry. As air delivered to rooms issues in a multiplicity of jets, the results reported for two parallel jets are basic to the subject. The jet velocities decrease from the outlet as the jet streams expand and merge. Quantitative data on the flow patterns and velocities are ready for early publication.

During the summer of 1955, tests were conducted on space heating with 95 F air, such as could be produced by heat-pump systems operating at a high coefficient of performance. Larger air volumes were used than in normal warm-air heating, and efforts were directed toward draft-less air flow. Air distribution was by 3 different systems: ceiling diffusers, high sidewall registers, and vertical discharge floor registers.

The same 3 systems were tested for summer cooling. The combined results will be reported soon.

Kansas State College: Linn Helander and associates continued the study of downward projection of heated air as from unit heaters and grilles. One paper reported the jet throw and flow pattern for an annular outlet and for a shallow diffuser. The information is useful to the manufacturers of unit heaters and to the designers of air-distribution systems. The work is expected to be completed in 1957.

Journal Section

Michigan State College: L. G. Miller, C. H. Pesterfield, and R. J. Waalkes completed the analysis of their data on friction losses in rectangular air-duct takeoff elbows and completed the paper on the subject. The friction losses were shown to vary in a complex manner with the proportion of the air flowing through the takeoff elbow. The project and paper provided valuable design data in a form directly usable by application engineers.

Combustion

Battelle Memorial Institute is in its second year of investigation of the causes and cures for pulsation and resonance noises from domestic heating furnaces and boilers fired by oil and gas burners. It has been shown

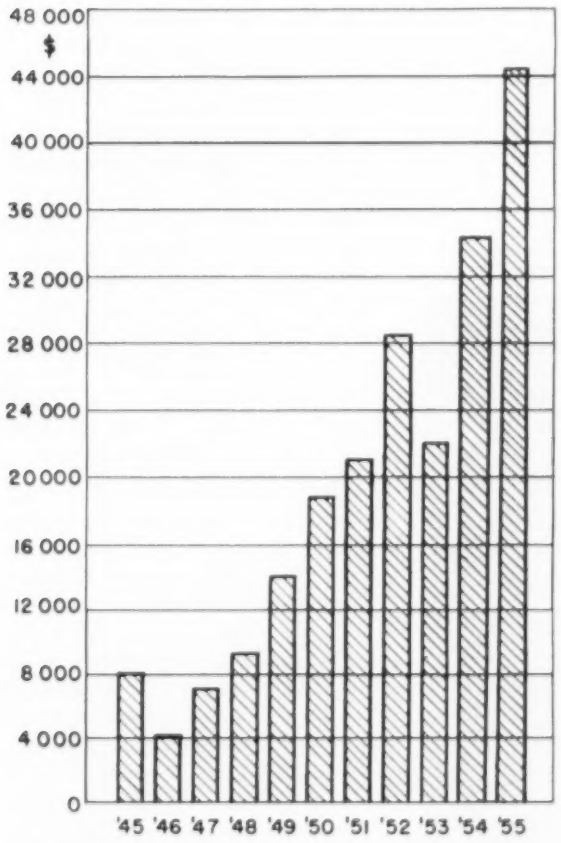


Fig. 2—Direct grants to co-operative research — 1945 to 1955

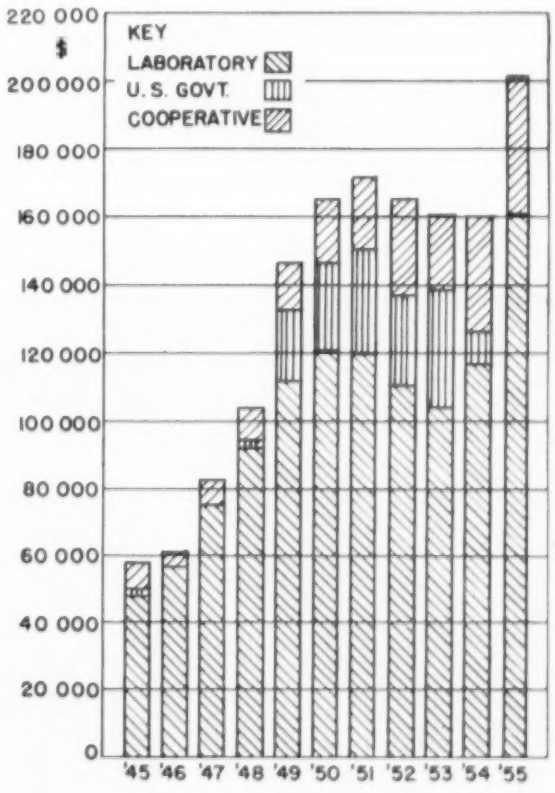


Fig. 3—Chart showing the nature of Society research expenditures — 1945 to 1955

that the burners, combustion chamber, and flues form an acoustical system with the flame as the driving element. High-speed motion pictures have shown the dancing of the flames in harmony with the noise.

Numerous factors of construction and air-fuel ratio adjustments affect the results. The study which is expected to continue into 1957 will develop design criteria.

Cooling Load

The calculation of air-conditioning cooling loads requires consideration of the periodic nature of sunshine and air temperature variations as well as the heat storage and release from structural masses. Two projects were completed in this field at the Research Laboratory and the results were reported and published.

The periodic heat flow through insulated concrete roof sections was measured in the solar calorimeter. The heat flow was also calculated by the Mackey-Wright equations. The results show that the equations are essentially correct and useful, and that the simplifying assumptions used in the equations were satisfactory. The tests were necessary to check the reliability of the equations.

The selection of design conditions from weather data was investigated in 1954 using data for New Orleans. The design conditions selected must be different for office buildings, theaters, and homes, because of the different types of loads and hours of occupancy. A method was demonstrated for tabulating solar radiations, dew-point and dry-bulb temperatures and their frequencies of occurrence. The selection of the design conditions can then be made for various cases. The project was completed and a paper published in April.

Heat Flow Through Glass

Proper skylighting requires an optimum combination of heat exclusion, light transmittance, and light distribution. Skylights contribute cooling load to structures.

Continuing from 1954, the periodic heat gain of structures from skylights was investigated by tests in the solar calorimeter at the Research Laboratory. Both prismatic and diffusing-type skylights were tested. Work has also been done on the performance of slat-type skylight shading devices.

Inside environment laboratory located at the Research Laboratory, where projects on panel heating and cooling are in progress

The first publication was for presentation at the January, 1956 Annual Meeting. It provides the essential data for predicting the heat-flow performance for 4 light-controlling skylights and 3 sheet-glass skylights. The instantaneous cooling load can be found for any combination of sun position, skylight orientation, and outdoor air temperature. A second paper is planned to follow shortly as the testing is completed.

Hot Water and Steam Heating

University of Illinois: W. S. Harris completed the installation of a residential-type hot-water heating system with special facilities for studying gas formation, migration and venting. Preliminary results show the formation of gas by corrosion, by release of dissolved air in the water charged to the system, and by decomposition of dissolved minerals in the water. The migration of air from the compression (expansion) tank by alternate solution in and release from the boiler water was also observed. Oxygen in the gas gradually combines with the iron piping and boiler. The study is continuing.

A second phase of the project is a study of air entrainment in the water flowing through a forced-circulation system having tubular convectors. Glass inspection sections are incorporated in the piping system to permit observation of the gas bubbles.

Northwestern University: Noises generated in pumps and water piping are a source of nuisance when these vibrations become audible, as from pipe and valve chattering or hissing.

Under the direction of W. L. Rogers, a third progress report for publication was written during the year. This covers new work in which a microphone was installed in 1½-in. straight pipe and the intensity of noise produced by the flowing water was found to be a function of the intensity of pressure drop. The frequency of water noise was mainly in the range of 20 to 75 cps (cycles per second), with a negligible part above 300 cps. Cavitation at orifices caused a marked increase in water noise. Water temperature alone has little

effect except as it contributes to cavitation. Pump and fitting noises were also explored.

Research on the metastable state of water is being continued by B. H. Jennings. A new metastable smooth-wall test chamber has been constructed in which the metastable state can be established with a minimum of difficulty. Shock patterns which have reached 4 psi have been read on mercury manometers, but it is believed that the inherent pressure impulses are greater than this in magnitude. Work is actively continuing with the accumulation of a large mass of data on various aspects of the phenomenon.

Human Calorimetry

The human calorimeter developed at the Research Laboratory and installed at the Naval Medical Research Center at Bethesda, Md., was essentially completed during the year. R. G. Huebscher from the Laboratory was in charge of the construction. Demonstration runs during September 1955 showed that the accuracy and performance met design expectations.

The instrument is unique in many design features. It will measure separately the heat liberation from the skin and respiration of an enclosed subject to an accuracy of 2 to 3 Btu an hour. The unit will be used for studies of metabolism, muscle efficiency and human performance under a wide range of environments.

Infiltration

Air infiltration to modern residences and buildings is a significant factor in heating and cooling loads but is understood for precise prediction only in vague terms.

University of Illinois: H. T. Gilkey and D. R. Bahnfleth made a number of infiltration tests during the 1954-55 heating system on a one-story residence with basement. The studies were also continued during summer months. The tests were run by injecting a quantity of helium into the house air and noting the decline in helium concentration as air leaked into and out of the house.

Preliminary results reported for the winter season indicated infiltration of about 0.6 air change per hour for this structure. Wind velocity and direction, and indoor-outdoor temperature difference are among the factors affecting the results. Tests are also to be run on a two-story residence before a final report is prepared.

Insulation

In cooperation with the TAC on Insulation, D. J. Vild of the Research Laboratory collected and tabulated much new data on heat transfer through building sections. In completion of the assignment, the new computed *U* values of overall heat transfer have been assembled in a quickly usable form for THE GUIDE, 1956.

Odors

The effect of air temperature and humidity upon odor perception was investigated at the Research Laboratory using pure compounds and tobacco smoke as odorants. The project was completed with a paper showing significant results.

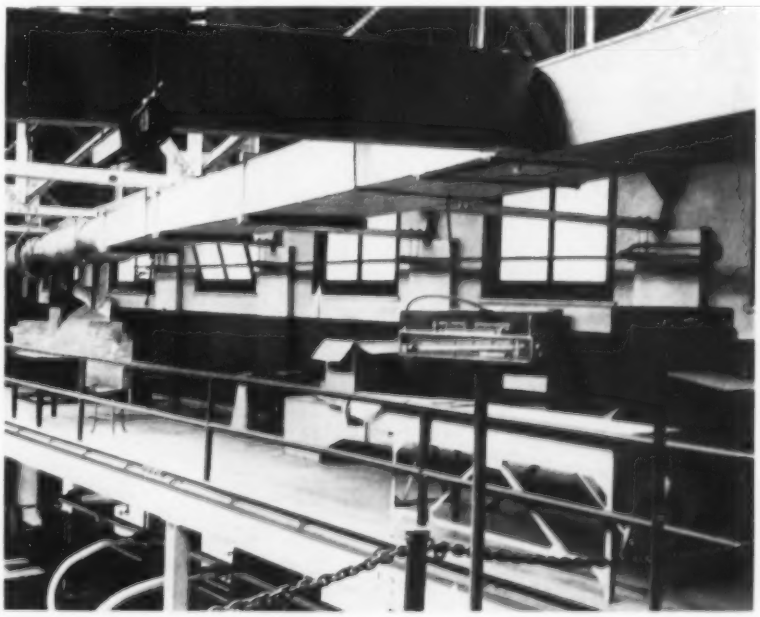
An increase in humidity generally reduced odor perception. For example, a *definite* odor of pyridine at 20 percent RH was barely *perceptible* at 80 percent RH. Both observations are the averages of numerous observations by different people while the odorant concentration remained the same in air at 80 F. Humidity did not affect the perception of tobacco odor to the same degree.

Increasing air temperature generally caused a slight decline in the intensity of the odor. Olfactory adaptation to odors and the relation of concentrations to perception were also measured. Future work is to include odor adsorption and release from room furnishings, and a study of methods of odor control.

Panel Heating and Cooling

During 1955, test work was completed on the heat transfer to and from heated and cooled panel surfaces of a room. The work was conducted in a special room 12 × 24.5 ft in the Research Laboratory. The design procedure for heating with ceiling panels using warm water was completed in cooperation with a sub-

Equipment erected at the Michigan State University for the investigation of the resistance to the flow of air through ducts and fittings



committee. The paper is for presentation at the 1956 Annual Meeting in Cincinnati. The procedure reported has been simplified as much as deemed practicable, and should be readily usable as well as of permanent value to the profession and the public.

A second paper was prepared relating the factors and coefficients of radiation and natural convection in a panel-heated room.

Tests of heat transfer from fluorescent lighting fixtures to a cooled ceiling panel were also completed and will be reported in the near future. As was known, some of the energy is transferred directly by radiation without first heating the room air, but good data were desired for design use in the cooling of rooms having high lighting intensities.

A program is presently under way to investigate the heat transfer between an outside cold wall of a room and the heated ceiling while the room-air temperature is held constant.

Sensations of Comfort and Physiological Research

During 1955 no projects were sponsored in the field of human response to thermal environment, but plans were made to begin a study of the effect of radiation and of humidity on human comfort. Early in 1956 a program is also to be developed for an investigation of the effect of thermal environment on human performance and productivity. Such research is urgently needed to lay the groundwork for the future development of year-round air conditioning in homes and industry.

Solar Energy Collectors

University of Minnesota: A program is now in progress under the direction of R. C. Jordan to study experimentally the solar heat transfer to a flat-plate collector, and the transfer from the collector plate to a fluid. The energy is available the year around even in cold climates and could be made available for household purposes by heat pumps and other means.

Two collectors with plates 7 ft-1 in. wide by 3 ft-3in. high have been installed and are tilted to the south. A 50-50 ethylene glycol-water mixture is the fluid pumped through tubing attached to the plates. Heat transfer and recorder equipment have also been installed. Test results have not yet been received.

Sorption

Pennsylvania State University: To develop the technology of moisture adsorption by solid sorbents, basic tests were conducted in 1954 on beds of silica gel under dynamic conditions. The research resulted in a paper presented in April, 1955 which aids in predicting the behavior of such adsorbents in practical dehumidifiers. Similar work on other sorbents is being planned by the TAC for a new project. A preliminary test code for laboratory testing of solid-sorption dehumidifiers was tried out and found to be practical within a permissible error of 6 percent.

Sound and Vibration Control

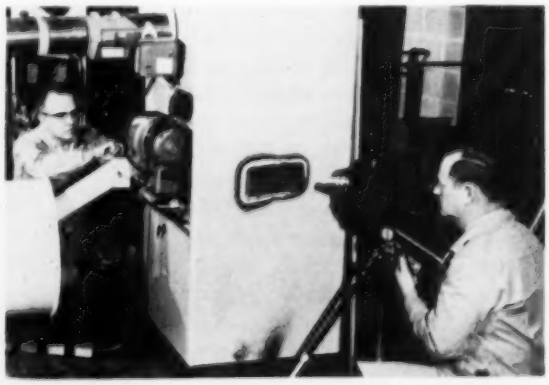
Late in 1955 the Research Laboratory began a program to develop a practical method for measuring the noise radiated from fans and allied equipment. Four known methods are to be investigated, after which a method is to be formulated that could be adopted as a standard by trade associations for rating equipment. Decibel levels at various frequencies are being measured. W. F. Kerka is conducting the research under the supervisory direction of C. M. Humphreys.

A second project, on noise measurement in duct systems, is to be started soon.

Thermal Circuits

The Research Laboratory has made further progress in applying the thermal-circuit technique to calculating diurnal heat flow through glass and through structural surfaces. The application of electronic computers has also been investigated and found promising for rapidly solving the complex equations for a variety of conditions. Papers on these subjects have been presented, and others are in preparation.

Part of the equipment constructed at the Research Laboratory for use in the determination of the effects of temperature and humidity on odor perception



Special equipment developed at Battelle Memorial Institute for study of oil and gas burner noise, and which permits use of photographic methods

University of California: Two papers on the electric-analogue studies of periodic heat flow through single wall sections and into a single-room enclosure were published. The calculated results compare very favorably with actual measurements, giving much encouragement to practical benefits. After the method has been developed for building sections of various kinds, and to single rooms, the method will be extended to multi-room and multiple-floor structures.

Weather Data

In cooperation with the Weather Bureau and Air Force, the TAC is working on the development of new tabulations of weather data for use by air-conditioning engineers and architects.

Research Papers and Reports

During the year, the research program resulted in the preparation of a number of papers and reports, most of which were presented at Society meetings during the year as indicated on the following list.

Presented at Oklahoma City Meeting, April 1955

Weather Data Analysis for Cooling System Design, by G. V. Parmelee, G. E. Sullivan and A. N. Cerny (JOURNAL SECTION, April 1955).

An Analysis Method for Predicting Behavior of Solid Adsorbents in Solid Sorption Dehumidifiers, by W. L. Ross and E. R. McLaughlin (JOURNAL SECTION, May 1955).

Presented at San Francisco Meeting, June 1955

Performance and Evaluation of Room Air Distribution Systems, by Alfred Koestel and G. L. Tuve (JOURNAL SECTION, March 1955).

Periodic Heat Flow Through Flat Roofs, by D. J. Vild, M. L. Erickson, G. V. Parmelee and A. N. Cerny (JOURNAL SECTION, July 1955).

Electric Analogue Prediction of the Thermal Behavior of an Inhabitable Enclosure, by Harry Buchberg (JOURNAL SECTION, June 1955).

A Rapid General Purpose Centrifuge Sedimentation Method for Measurement of Size Distribution of Small Particles, Part II, Procedures and Applications, by K. T. Whitby (JOURNAL SECTION, June 1955).

Size Distribution and Concentration of Air-Borne Dust, by K. T. Whitby, A. B. Algren and R. C. Jordan (JOURNAL SECTION, August 1955).

Presented at Cincinnati Meeting

Noise Production and Damping in Water Piping, by W. L. Rogers (JOURNAL SECTION, January 1956).

Thermal Design of Warm Water Ceiling Panels — A Design Manual — Prepared by members of the Research Laboratory Staff and a subcommittee of the TAC on Panel Heating and Cooling (JOURNAL SECTION, December 1955).

Heat Gain Through Glass Skylight Fenestrations, by D. J. Vild and G. V. Parmelee (JOURNAL SECTION, January 1956).

Journal Section

Characteristics of Downward Jets from a Vertical Discharge Unit Heater, by S. M. Yen, Linn Helander and L. B. Knee (JOURNAL SECTION, November 1955).

Resistance of Rectangular Divided-Flow Fittings, by L. G. Miller, C. H. Pesterfield and R. J. Waalkes (JOURNAL SECTION, January 1956).

Electric Analog Studies of Single Walls, by Harry Buchberg (JOURNAL SECTION, October 1955).

Unscheduled Papers

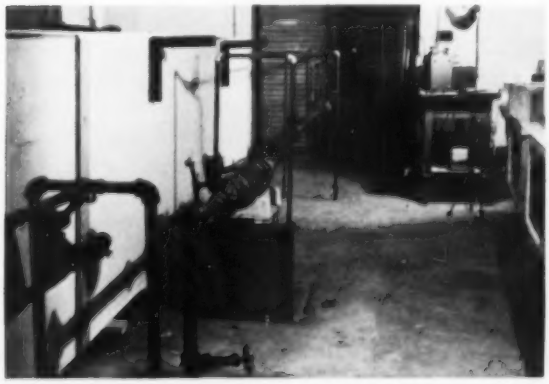
Natural Convection and Radiation in a Panel-Heated Room, by T. C. Min, L. F. Schutrum, G. V. Parmelee and John Vouris.

Temperature and Humidity Effect on Odor Perception, by W. F. Kerka and C. M. Humphreys.

Laboratory for Solar Engineering Study at Minnesota, by R. C. Jordan and J. L. Threlkeld.

In addition to the foregoing papers prepared for Society meetings, G. V. Parmelee also prepared a paper, Applications of Meteorological Data to Indoor Climate in Buildings, presented to the *American Meteorological Society*.

Air Velocities in Two Parallel Ventilating Jets, by Alfred Koestel and J. B. Austin (see this issue, p. 137).



Sources of noise in water piping and in pumps are investigated by the use of this testing setup located at Northwestern University

A project at the air cleaning laboratory of the University of Minnesota has developed equipment for determining dust concentrations in the air

The Heat Pump

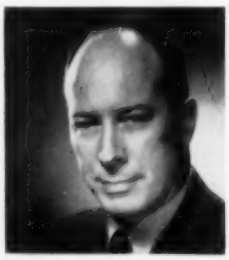
By E. P. Palmatier*, Syracuse, N.Y.

The time has come to remove the cloak of mystery that has seemed to surround the heat pump. Future research on coil defrosting, thermal storage materials and solar collectors may improve operating economy, but these things are not prerequisite to expanded use of the heat pump for all-year comfort. This is the message of the TAC on the Heat Pump to Society members.

The TAC on the Heat Pump was organized in 1948 with Dr. R. C. Jordan as chairman. Its first notable activity was the preparation of an outline for heat pump research, organized according to type of heat source. This was published together with a brief article on the committee's activities in the November 1950 issue of Heating, Piping and Air Conditioning. The original committee also established two research projects: one at Columbia University to study moisture migration in sandy soils, the other at the University of Minnesota to qualify solar collectors as heat source elements. These two projects resulted in six papers, five of which have been presented to the Society and published in the Journal (June, December, 1953; January, February, 1954; February, 1955). The solar collector project has recently been transferred to the new TAC on Solar Energy Utilization.

Early Activities

Somewhat more historical background may be of interest. In the first few years of its existence, the TAC on the Heat Pump maintained close contact with a committee formed by the Association of Edison Illuminating Companies and Edison Electric Institute. The AEIC-EEI Committee was probably the first important industry group established for the promotion and development of heat pump equipment. Under Chairman Gene Ambrose, it established definitions for



Coefficient of Performance (COP) and Seasonal Performance Factor of heat pump equipment and systems (EEI Bulletin, October 1948), sponsored the development and field trial of heat pump water heating units and directed a research program on heat storage in certain crystalline materials.

Committee Reorganizes

In September 1952 the present membership of the TAC on the Heat Pump was chosen with the thought that the committee should include representatives from electric utilities, equipment manufacturers, academic institutions, independent research laboratories and professional engineering. As a first undertaking a subcommittee headed by John Swanton was assigned the task of investigating the status of work on heat storage. A report was submitted to the TAC and forwarded to Society headquarters in May of 1954 with the suggestion that it be published.

In the last year and a half the Heat Pump TAC has been relatively inactive. It has been in touch with a research project on frosting of coils under way at the University of Illinois and offered to recommend financial support of the work by ASHAE. However, funds already obtained appear adequate and consistent with available manpower.

At its last meeting the Committee discussed ways in which its membership and the Society might further advance the technology of heat pumps. It was noted that in spite of considerable research on ground heat source elements, it seems unlikely that ground heat will be used extensively. Almost all unitary heat pumps currently use either outside air or water source. Units are available for residences and small commercial establishments and thousands of successful installations have been made. Large installations have been installed by the score in office buildings, hospitals and schools, but progress has been slower than might have been anticipated considering the technical and economic success of the pioneer installations.

Powerful forces impel the air-conditioning and electric utility industries to promote heat pump installations on sound economic grounds. The Heat Pump TAC urges ASHAE engineers to study what has been accomplished and prepare to take advantage of the opportunities which lie ahead.

Heat Pump TAC Scope

The objective of the TAC on the Heat Pump is to provide and encourage acquisition and dissemination of basic data for application of heat pumps for space heating and cooling relating specifically to (1) heat sources and sinks, (2) heat storage, (3) air distribution, (4) control, and (5) capacity requirements and equipment selection.

*Chairman, ASHAE Technical Advisory Committee on the Heat Pump.

Summary of Chapter Meetings*

Journal Section

• *ARIZONA:* A professional weather consultant, Carl Erickson, spoke at the November meeting on proper design for temperature conditions, relating to heating and cooling in Phoenix and Tucson, Ariz. J. B. Hoaglund, program chairman, introduced the guest speaker.

Pres. W. A. Biddle called for reports from the committee members and officers. Attendance 37. Attendance ratio 0.52.

• *ARIZONA:* P. A. Engebretson was introduced as chairman of the membership committee at the October meeting, presided over by Pres. W. A. Biddle.

The program committee chairman, J. B. Hoaglund, introduced J. W. May, technical director, Air Filter Division, American Air Filter Co., Inc., Louisville, Ky., who spoke on the *Selection and Application of Air Filters*. Attendance 29. Attendance ratio 0.39.

• *ARKANSAS:* Prof. E. R. Queer, treasurer of the Society, University Park, Pa., gave an interesting report on Society activities at the November meeting. The principal talk of the evening was a discussion by Professor Queer on air conditioning of caves for storage. He told of many caves and mines throughout the United States, from a few acres to 130 acres in size, used for storage of many items; foodstuffs of all kinds, machine tools and other products. Professor Queer explained that most of the caves were air conditioned to maintain and control temperature and humidity. Pres. J. L. Brown presided at the meeting. Attendance 19.

• *ATLANTA:* The chapter was host to P. B. Gordon, second vice president of the Society, New York, N. Y., at the November meeting. Vice President Gordon spoke on the *Possibilities of Panel Cooling*. Pres. T. A. Barrow, Jr., presided. Attendance 80. Attendance ratio 0.49.

• *BATON ROUGE:* Gus Pailet, program committee chairman, introduced the guest speaker for the November meeting, W. B. Moses, Jr., owner, Engineering Sales Co., New Orleans, La., who gave a talk on *Water Treatment as Related to Air Conditioning and Heating*. Mr. Moses was given a standing ovation following his talk. Pres. C. S. Woodruff presided at the meeting. Attendance 32. Attendance ratio 0.49.

• *BRITISH COLUMBIA: Natural Gas—Up to Date* was the subject of a detailed presentation given at the meeting in November by Howard Walters, British Columbia Electric Co. Mr. Walters, who was introduced by R. B. McDonell, program committee chairman, spoke of the trials and tribulations which will arise before natural gas becomes available in the Vancouver area.

B. W. Farnes, member of Council, gave an outline on the importance of increased chapter membership. Eight prospective new members were introduced at the meeting. Attendance 40. Attendance ratio 0.46.

• *CENTRAL NEW YORK:* Pres. L. A. Childs called upon R. A. Baker at the November meeting to introduce the guest of honor and speaker of the evening, John E. Haines, president of the Society. President Haines, of Minneapolis, Minn., greeted members and guests in his warm and friendly manner and then gave an interesting talk on *The Next Ten Years*, punctuated by projected graphs, tables and photographs. This was President Haines' fifty-first chapter visit, and he gave considerable encouragement for the prospects of engineering and its allied industries and activities for the next ten years. President Haines predicted 20,000 Society members with 80 chapters by 1965. Attendance 60. Attendance ratio 0.31.

• *CENTRAL OHIO:* The Columbus Technical Council and the Central Ohio Chapter met jointly in November to hear E. J. Workman, president, New Mexico Institute of Mining and Technology, Socorro, N. M., speak on *Controlled Weather*. No business meeting was held.

• *CINCINNATI:* Pres. A. H. Gerdsen read a letter at the November meeting from Charles Gruber, Cincinnati Bureau of Smoke Inspection, requesting one of the chapter members to serve on a committee to study smoke conditions in Cincinnati. W. H. Junker was appointed to serve on this committee.

A. W. Edwards, representative of Region 2, Chapter Relations Committee, gave a report on the activities and duties of this committee.

The *Performance and Operational Costs of Waterless Air Conditioners* was the subject of the guest speaker, P. W. Wyckoff, chief engineer, Airtemp Division, Chrysler Corp., Dayton, Ohio. Attendance 53.

• *DELTA:* Pres. W. B. Martin, Jr., called for each committee chairman to give a brief report on the activities of his respective committee at the November meeting.

E. H. Sanford introduced L. M. Evans, sales manager, Standard Pump Division, Worthington Corp., Harrison, N. J. The subject of his talk was *Pumps for Air Conditioning*. At the conclusion of his presentation many questions were asked from the audience, and Mr. Evans was given a rising vote of thanks. Attendance 54. Attendance ratio 0.35.

• *EMPIRE STATE CAPITAL:* A discussion on means of improving attendance was held at the November meeting. The member and alternate member of the Chapters Conference Committee were announced as Pres. L. V. Appleby and M. E. Waddell, respectively.

G. G. Davis presented the speaker, Mr. Beattie, Hunter Fan & Ventilating Co., Memphis, Tenn. He gave a detailed dissertation on fan ventilation. Attendance 18. Attendance ratio 0.26.

• *ILLINOIS:* Program Chairman A. W. Lippitt introduced the two speakers at the November meeting, F. A. Loebel, vice president in charge of engineering, Cleaver-Brooks Co., Milwaukee, Wis., and W. E. Everham, Pacific Steel Boiler Division, National-U. S. Radiator Corp., Johnstown, Pa. They discussed the *Relative Merits of Package Boilers vs. Built-up Boiler-Burner Units*. Mr. Loebel listed the advantages of package boilers and Mr. Everham defended the advantages of built-up boiler-burner units.

Vice Pres. H. G. Gragg announced details of the 1956 Annual Meeting to be held in Cincinnati on January 23-25, 1956 and urged all members to attend. Pres. G. G. Freyder presided. Attendance 169.

• *INDIANA:* Two speakers were presented to the membership at the November meeting by W. L. Kercheval, Ray Wetzel, superintendent of air pollution control, City of Indianapolis, and Joseph Newberg outlined the work that has been accomplished to make Indianapolis one of the cleaner cities in the country. The audience was informed that industrial Indianapolis made a considerable investment during 1954 for preventive air pollution equipment. Attendance 33.

• *INLAND EMPIRE:* Pres. F. W. Jenkinson announced at the November meeting that R. B. Campbell would be the Inland Empire member of the Chapters Conference Committee, with Max Tonn as alternate member.

S. R. Stillwell introduced Nathan Gellert, Spokane Gas & Fuel Co., who talked on what natural gas will do for the local communities when it arrives in July 1957. Attendance 32. Attendance ratio 0.58.

• *KANSAS:* Vice Pres. H. M. Skalla, presiding at the November meeting, introduced the speaker, John W. James, first vice president of the Society, Chicago. Vice President James discussed *How Healthy Is Air Conditioning*. Attendance 32.

• *KANSAS CITY:* Pres. A. S. Hurt, Jr., announced at the November meeting that a congratulatory telegram had been sent to the newly-organized 61st chapter of the Society at Baton Rouge, La.

J. M. Arthur, Jr., was honored with a life membership certificate presented to

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

him, at the request of President Hurt, by John W. James, first vice president of the Society, who was in attendance as the speaker of the evening. Mr. Hurt thanked the Society and Chapter for so honoring him.

Program Chairman R. M. Spencer then formally introduced the speaker, Vice President James, Chicago, Ill., who delivered a highly informative talk on the comfort aspects of air conditioning. The talk was illustrated with slides and was concluded with some thought-provoking remarks, indicating that the industry needs to do a better selling job. Attendance 66. Attendance ratio 0.26.

• *MANITOBA:* J. F. Bertram introduced the speaker at the November meeting, Evan McCormick, executive director of the Winnipeg chamber of commerce. Mr. McCormick's informative presentation of the *Probable Impact of the St. Lawrence Seaway Project on Western Canada* was very well received by the members and guests. Following a period of questions and discussion, P. L. Charles thanked the speaker. Pres. G. C. Davis presided. Attendance 29. Attendance ratio 0.55.

• *MASSACHUSETTS: Combustion Safeguard Controls* was the topic discussed by Harold Gilchrist, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., at the November meeting. After a spirited question and answer period, the meeting was adjourned by Pres. G. D. Fife. Attendance 75.

• *MEMPHIS:* Program Chairman W. L. Henson introduced the November speaker, J. P. Beattie, chief ventilating engineer, Hunter Fan & Ventilating Co., Memphis, Tenn. Mr. Beattie used slides to illustrate his talk on *Residential, Commercial and Industrial Ventilation.* He covered the use of propellor fans for exhaust and air movement to achieve ventilation and/or cooling in residential, commercial and industrial applications. Particularly in large shop or warehouse areas, Mr. Beattie explained, exhaust fans to remove solar and process heat gain and propellor fans for air movement achieve cooling effect where air conditioning is not economically feasible.

The chapter's attendance record was discussed with the attendance or telephone committee, W. L. Henson, R. H. Bolding and J. P. Manis. Secy. L. V. Eberle, Jr., was authorized to survey the membership to determine what is required to increase attendance at the chapter meetings. Attendance 18. Attendance ratio 0.25.

• *MIAMI VALLEY:* Donald Gardner, chief of service, Bell & Gossett Co., Morton Grove, Ill., spoke at the November meeting on *High-Temperature High-Pressure Hot Water Systems.* In his talk, Mr. Gardner stated that any temperature under 250 F is considered low temperature water, and no special equipment is needed. He then went on to show typical high-pressure high-temperature hot water systems, the correct piping for such systems and the benefits derived from their use.

Three members were appointed to assist the membership chairman in his duties: F. J. Ossenberg, R. J. Perkins and E. S. Stoermer. Attendance 35. Attendance ratio 0.43.

• MINNESOTA: Enthusiastic reception was given to a non-technical talk on *Self Improvement* at the November meeting by C. V. McBroom, director of manufacturing, Meredith Publishing Co., Des Moines, Ia.

J. S. Locke made a report on the Building Products Executive Conference held in Washington, D.C., sponsored by the F. W. Dodge Corp., New York, N.Y. Included in this report were statistics on the future of building construction. Attendance 99.

• *MISSISSIPPI:* D. F. Ingram introduced the November speaker, H. H. Korff, mechanical engineer, Johnson Service Co., Chicago, Ill. The title of Mr. Korff's talk was *Control Problems Arising from Variable Air Handling Systems.* Pres. B. L. Palmer presided. Attendance 29.

• *MONTREAL:* Pres. R. J. Ker extended a warm welcome to all those present at the November meeting. Following the business meeting, the members went through a modern electric motor plant, The Electric Tamper and Equipment Co., Lachine, Que. An informative talk on motors was given at the plant. Attendance 70.

• *NEW YORK:* Pres. Albert Giannini presented Society Pres. John E. Haines, Minneapolis, Minn., to the audience at the November meeting. Speaking on *The Next Ten Years,* President Haines showed a number of statistics on population growth, building construction, school requirements, demand for improved heating and cooling, etc. He indicated that in the next ten years there would be a tremendous demand for heating, ventilating and air-conditioning equipment. He also showed the ways in which the Society is serving the engineering profession and the public through research and publication of the results of research, and through publication of THE GUIDE, which describes current practice. At the conclusion of the talk, President Giannini expressed the appreciation of the members and guests for the highly instructive presentation.

Business of the meeting included the appointment of the following committees: *Reception*—H. B. La Force, chairman, P. A. Bourquin and Sherman Loud; *Membership*—Nathan Feder, chairman, L. D. Carr, R. B. Darling, F. A. Fideli, H. G. Junger and O. F. Quist. President Haines presented Life Membership certificates to A. L. Baum and C. J. Doughty. Because of illness, V. J. Cucci was unable to accept his certificate in person. All three members also had life membership in the New York Chapter conferred upon them. Attendance 65. Attendance ratio 0.21.

• *NORTH TEXAS:* At the meeting in November, Pres. J. A. Ray announced the appointment by the board of governors of G. H. Meffert as member and E. T. Gessell as alternate member of the Chapters Conference Committee.

O. H. Mehl, program committee member, introduced E. P. Palmatier, director of research, Carrier Corp., Syracuse, N. Y. Mr. Palmatier discussed air-cooled *vs.* water-cooled residential air-conditioning equipment. As a basis for his discussion, water-cooled equipment utilizing a mechanical draft tower and pump selected at 80 F wet bulb was compared with air-cooled condensing equipment of equal capacity selected at 100 F dry-bulb temperature. Using projector slides of graphs and diagrams, Mr. Palmatier effectively illustrated comparative power and water consumption of one system *vs.* the power consumption of the other. In order to effect the basic concept of equal capacity of the two systems, the cooling loads were figured on a 24-hr. basis. The lengthy question and answer period following was stimulating. Attendance 45. Attendance ratio 0.47.

• *NORTHERN PIEDMONT:* New officers unanimously elected at the November meeting were as follows: *President*—L. R. Gorrell; *Vice President*—C. A. Cofer; *Secretary*—C. E. Amick; *Treasurer*—E. A. Stroupe, Jr.; *Board of Governors*—S. T. Oliver, R. B. Knight and M. G. Saunders.

Program Chairman Cofer introduced the guest speaker, Prof. E. R. Queer, Society treasurer, University Park, Pa., who talked on *Air Conditioning Caves for Storage.* Attendance 28. Attendance ratio 0.21.

• *OKLAHOMA:* E. R. Queer, Society treasurer, University Park, Pa., gave the members at the November meeting the benefit of his knowledge on *Air Conditioning Caves for Storage.* Professor Queer, who was introduced by W. J. Collins, Jr., illustrated his talk with slides depicting the storage caves in the Atchinson, Kans., vicinity. He described the problems encountered in dehumidification of working and storage spaces. The limestone caves were originally used for food storage, but since the Government disposed of the food, the caves are used for storage of machine tools. Professor Queer explained that the refrigeration equipment, originally installed, has been abandoned in favor of straight humidity control. In addition to his technical discussion, Professor Queer talked on the aims and research of the Society. Pres. J. R. Patten presided at the meeting. Attendance 58. Attendance ratio 0.43.

• *ONTARIO:* Pres. D. L. Angus presided at the November meeting. Mr. Martin, brewmaster of the Molson's Brewery, Toronto, outlined the inspection trip to be made through his company's new brewery. Following adjournment, an inspection of the mechanical equipment of this $11 million building was held. Attendance 165.

• *OREGON:* Tracing the history of the discovery and use of natural gas, Sam

Ericsson, assistant to the president, Portland Gas & Coke Co., Portland, Ore., gave an interesting talk at the November meeting. Mr. Ericsson, who was introduced by W. R. Norte, forecast a bright future for the industry and the region with the advent of natural gas to the Northwest. The presentation was well received.

During the business part of this meeting, which was presided over by Pres. Dick Blankenship, a nominating committee was elected by written ballot. B. W. Farnes was elected chairman, with T. E. Taylor, W. B. Morrison, K. H. Hanson and J. P. McDermott as committee members. Attendance 86. Attendance ratio 0.42.

• *OTTAWA VALLEY:* The C. A. Dunham golf trophy was presented to G. A. Gray by Pres. E. J. Schoenherr at the October meeting. Vice Pres. N. J. Howes was elected as member of the Chapters Conference Committee.

Vice President Howes introduced the guest speaker, Claude Lentz, head of research section, Division of Applied Biology, National Research Council, Ottawa. He spoke on *The Refrigeration of Food and Food Storage and Freezing as Applied to Refrigerated Railway Cars.* With the advent of the increasing variety of frozen foods being made available to the public today and the lower temperatures required to maintain these foods during transportation, the problem of providing adequate mechanical refrigeration is of primary importance. Mr. Lentz concluded by stating that most of the major difficulties connected with mechanical equipment had been solved, but further tests are necessary with respect to vapor pressures and wind conditions. Attendance 31. Attendance 0.56.

• *PHILADELPHIA:* Society Pres. John E. Haines, Minneapolis, Minn., gave an optimistic forecast on *The Next Ten Years* at the November meeting. P. H. Yeomans, program chairman, introduced the guest speaker, and A. M. Robertson was the presiding officer. Attendance 74.

• *PITTSBURGH:* At the 10th annual joint meeting with *ASRE* held in October, the ASHAE Pittsburgh Chapter acted as hosts and Pres. C. L. Benn presided.

Program Chairman E. J. Busch introduced the speaker, C. M. Humphreys, assistant director of research, ASHAE Research Laboratory, Cleveland. Mr. Humphreys, a past president of this Chapter, spoke on the *Activities of the Research Laboratory,* discussing the present work and accomplishments of each committee. Mr. Humphreys also talked on *Panel Heating and Cooling.* Attendance 117.

• *ROCKY MOUNTAIN:* John W. James, first vice president of the Society, introduced by A. S. Widdowfield, presented his illustrated talk on *How Healthy Is Air Conditioning* at the November meeting. He explained the human heat machine and how the four thermostats of the machine regulate body temperatures. He discussed the comfort zone-effective temperature chart and outlined briefly the five basic factors of any year-round air-conditioning system; heating, cooling, moisture, control and quality. The most important part of Vice President James' presentation was a discussion on how the members can best reach the public so that people may think in terms of year-round comfort. His appeal for the use of salesmanship to tell the story was thought-provoking, as was evidenced by the active discussion period that followed.

Pres. L. L. DeLong expressed his thanks and the appreciation of the members and guests to Vice President James. Attendance 42.

• *SACRAMENTO VALLEY:* Pres. R. A. Sarro, presiding at the October meeting, suggested that some thought be given to ways and means of improving public relations in the community.

V. W. Thornburg introduced the speaker of the evening, F. M. Iwerks, engineer, C. C. Moore & Co., San Francisco, who showed an interesting film on *Steam for Power.* The movie traced the history of the development of steam power. Attendance 43. Attendance ratio 0.47.

• *ST LOUIS:* Following the reading of reports at the November meeting, Pres. E. T. Clucas turned the meeting over to W. P. Norris, program chairman. Mr. Norris introduced the speaker of the evening, E. C. Decker, Carrier Corp., Syracuse, N. Y. The topic of his talk was *Psychrometry and the Psychrometric Chart.* Attendance 56.

• *SOUTH CAROLINA: Looking Ahead at the Air-Conditioning Industry* was the subject of the October guest speaker, W. L. Sammons, district sales manager, Unitary Equipment Division, Carrier Corp., Charlotte, N. C. F. A. Bailey, III, introduced the speaker. Pres. R. K. Rouse presided at the meeting. Attendance 27. Attendance ratio 0.27.

• *SOUTH TEXAS:* P. B. Gordon, second vice president of the Society, New York, N. Y., spoke at the October meeting on *Panel Cooling.* Vice President Gordon also presented several thoughts concerning the Society.

W. A. Sharp, chairman of the finance committee, reported on the various activities planned for his committee and announced that the committee would endeavor to raise $1,000 for the F. E. Giesecke Memorial Fund. Pres. F. M. Neil presided.

• *SOUTHERN CALIFORNIA:* A past presidents pin was presented to C. D. Walz at the October meeting by Pres. J. L. McCullough. President McCullough appointed H. B. Nottage as chairman of a committee to investigate the possibilities of holding a Society meeting in Los Angeles. Leo Hungerford was appointed as a member of the committee with further appointments to follow.

Program Chairman G. D. Lord introduced Ed Hamilton, Ralph M. Parsons Co., who spoke on *Industrial Air Conditioning.* The talk was a humorous and interesting discussion of various industrial air-conditioning problems encountered by the speaker.

• *SOUTHERN PIEDMONT:* The guest speaker at the October meeting, A. C. Buensod, president, Buensod-Stacey, Inc., New York, N. Y., talked on *Air Conditioning in Tobacco Manufacturing and Processing.* J. R. Clark, program chairman, introduced Mr. Buensod.

Pres. L. F. Lawrence appointed J. A. Rice as member and W. P. Wells as alternate member of the Chapters Conference Committee. Attendance 67. Attendance ratio 0.31.

• *SOUTHWEST TEXAS:* Those present at the October meeting were highly complimentary of the way in which the guest speaker, P. B. Gordon, second vice president, New York, N. Y., developed an interesting and technical subject in a short talk. Vice President Gordon spoke on the *Possibilities for Panel Cooling,* using slides to demonstrate. He also explained the proposed by-law changes and commented on the growth of ASHAE.

Pres. F. B. Frazee called on Past Pres. W. E. Long to present the past presidents pin to L. H. Hornor, Jr. Attendance 25.

• *TOLEDO:* Robert Macrae, manager, applied engineering section, Carrier Corp., Syracuse, N. Y., gave a technical presentation at the November meeting. Mr. Macrae discussed the *Evolution of the Twenty-Four Hour Cooling Load Method of Calculation* for residential application.

Robert Greenwald, chairman of the committee to inaugurate a course in air conditioning at the University of Toledo, gave a progress report. Vice Pres. J. J. Heilman presided. Attendance 49. Attendance ratio 0.33.

• *UTAH:* Vice Pres. W. L. Stuewe presided at the October meeting. Announcements were made concerning the 62nd Annual Meeting of the Society. A suggestion was made that when the Salt Lake City building ordinances are published they should be discussed by the Society with regard to how heating system design in this area is affected.

• *VIRGINIA: Air Conditioning in Existing Buildings* was the topic covered by F. H. Buzzard, chief engineer, Charles S. Leopold, Philadelphia, Pa., at the November meeting. He was presented to the audience by A. B. Miller, program chairman. Pres. T. B. Carpenter presided. Attendance 35. Attendance ratio 0.43.

• *WASHINGTON, D. C.:* A nominating committee, consisting of G. C. F. Asker, G. R. Walz and J. G. Muirheid, was appointed at the October meeting by Pres.

W. C. Reamy. P. R. Achenbach gave a short report on the preparations being made for the 1956 Semi-Annual Meeting to be held in Washington, D. C.

Program Chairman L. H. Holder introduced the guest speaker, A. C. Crawford, air conditioning engineer, Potomac Electric Power Co., Washington, D. C. The subject of the talk was *Heat Pumps* and their operating cost in the Washington, D. C. area. Mr. Crawford based his talk on the results of a 14-month survey on several air source heat pumps. The talk and discussion following were very well received. Attendance 112.

• *WESTERN MASSACHUSETTS:* B. R. Washburn, chairman, read the report of the nominating committee, selecting A. M. Lovenberg and S. K. Smith, as nominees for election to the posts of member and alternate member, respectively, of the Chapters Conference Committee. They were elected at the November meeting.

Vice Pres. J. E. Reed introduced Joseph Balter, Taco Heaters, Inc., Cranston, R. I., who spoke on the design and installation of snow-melting systems. A discussion period followed Mr. Balter's presentation. Attendance 45. Attendance ratio 0.68.

• *WESTERN MICHIGAN: The Austin Village Project* was the topic covered by the October guest speaker, C. W. Nessell, heating industry consultant, Minneapolis-Honeywell Regulator Co., Chicago, Ill. Mr. Nessell explained that the project, in Austin, Tex., was a group of 22 air-conditioned homes. There have been many findings of interest to date, and more study is to be made. Mr. Nessell concluded by saying that it has been determined that people will have to be educated on how to live with air conditioning in a home, to learn what they might expect from the cooling system. Program Chairman F. K. Platt introduced the speaker.

A code committee was formed, with Mr. Platt as chairman. Attendance 62.

• *WESTERN NEW YORK:* At a joint meeting of *ASRE* and ASHAE held in November, Society Pres. John E. Haines presented a Life Membership certificate to Roswell Farnham.

Addressing the audience on *The Next Ten Years*, President Haines reviewed the growth of the building, heating, air conditioning, and other alien industries from 1945 to 1955. He also gave possible growth predictions of these industries for the coming ten years. President Haines concluded with an explanation of the research work of the Society. Attendance 74.

• WISCONSIN: Pres. I. J. Rossiter read a letter at the November meeting which had been received from Mr. Heim, Wisconsin School Administrators Group, extending his thanks to the Wisconsin Chapter for furnishing speakers for their October meeting.

The program chairman, Keith Forfar, introduced the speaker of the evening, J. H. Erb, chief engineer, Chicago District Machinery and Systems Division, Carrier Corp. His topic was air conditioning multi-room, multi-story buildings. Attendance 77. Attendance ratio 0.30.

Special Branch

• SWITZERLAND: At the meeting in November, the 4th annual meeting of the Chapter, Pres. H. C. Bechtler gave the

Walter Hausler

annual report of the president. He advised in detail about the activity of the special branch during the year, specifically mentioning the highly successful technical conference organized by the chapter and held during the spring.

The by-laws of the Switzerland Special Branch, translated into German by President Bechtler, were approved by the executive committee.

The following officers were unanimously elected: *President*—Walter Hausler, *Vice President*—John Frei; *Secretary*—L. F. de Bruyn; *Treasurer*—Werner Niederer; and *Controller*—Werner Gysi.

After the meeting all the members and their ladies participated in a well-organized and pleasant banquet and entertainment. Attendance ratio 0.85.

Student Branch

• PURDUE UNIVERSITY: The air conditioning system of the new Life Science Building at Purdue University was described by G. B. Supple, district manager, American Blower Corp., Indianapolis, Ind. Mr. Supple led an inspection trip through the building after the November meeting.

Pres. D. B. Doucette presided over the business section of the meeting, where a report was given by R. F. Puncochar, membership coordinator, emphasizing the importance of bringing lower classmen into the organization. W. F. Currise and S. E. Fenstermaker, Jr., from the Indiana Chapter, discussed the W. T. Miller Award. Attendance 25. Attendance ratio 0.40.

Nation's Capital Site of Semi-Annual Meeting, 1956

The Society's Semi-Annual Meeting 1956 will be held June 18, 19, 20, 1956 in the Shoreham Hotel, Washington, D.C. with a program tentatively consisting of five sessions and two symposia. It is expected that 13 papers will be presented beginning with the first session Monday morning, June 18. The Pro-

P. R. Achenbach
General Chairman

gram and Papers Committee is planning on one session Monday, two on Tuesday and Wednesday mornings, respectively, and the two symposia on Wednesday afternoon. One symposium is planned for a discussion of Codes and Standards, the other on Residential Air Conditioning.

P. R. Achenbach, General Chairman of the Washington, D.C. Chapter Committee on Arrangements, reports that the special events program is nearly complete with a number of functions of interest to the members and their families.

Assisting Chairman Achenbach are: W. C. Reamy, vice chairman, and the following Committee Chairmen: J. G. Muirheid, Reception; G. C. F. Asker, Sessions; S. R. Allen, Transportation; F. A. Leser, Banquet; J. H. Broome, Entertainment; A. S. Gates, Jr., Finance; Mrs. J. H. Broome, Ladies; B. P. Evans, Publicity; F. E. McArdle, Sports.

The nation's capital offers limitless opportunities to relive the history of America. It is expected many members will arrive early to take advantage of the weekend so that they may visit the many historical and world renowned places in and near Washington, D.C.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 85 men who are candidates for membership, or advancement in membership grade.

Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before February 29, 1956, of any whose eligibility for membership is questioned. Unless such objection is made, these candidates will be voted upon by the Council.

Note: †Reinstatement *Advancement

ARIZONA (*Region* 5)

GABBARD, F. W.,* A-C. Consultant, Arizona Public Service Co., Phoenix.

CALIFORNIA (*Region* 5)

BLOCH, G. A., Sales Engr., Robert B. Holland Co., North Hollywood.

GESELBRACHT, WILL,† Sr. Mech. Engr., State Division of Architecture, Los Angeles.

HILL, W. E. Reg'l. Mgr., The Pyle—National Co., Los Angeles.

WALZ, C. D.,* Cons. Engr., Pasadena.

COLORADO (*Region* 4)

SELLERS, SIDNEY, Chief Engr., Dependable Plumbing & Heating Co., Denver.

CONNECTICUT (*Region* 1)

HOYT, W. K., Office Mgr., Paul D. Harrigan, New Haven.

DELAWARE (*Region* 2)

MAHAFFY, HUGH, Engr., Robert P. Schoenijahn, Cons. Engr., Wilmington.

FLORIDA (*Region* 6)

SCHROEDER, R. M., Mech. Engr., A-C. Sec., Maurice H. Connell and Assocs., Inc., Miami.

WILDER, F. B.,* Chief Engr., W. W. McMillan Co., Jacksonville.

ILLINOIS (*Region* 3)

BARR, J. C., Sales Engr., Johnson Service Co., Chicago.

ERICKSON, S. O., Sales Engr., Minneapolis-Honeywell Regulator Co., Chicago.

YATES, C. P., Sales Mgr., Uni-Flo Div., Barber-Colman Co., Rockford.

INDIANA (*Region* 3)

ANDERSON, R. M.,* Partner, A. B. Keller Co., Indianapolis.

KANSAS (*Region* 4)

HOFFMAN, J. H., Office Mgr., The Trane Co., Wichita.

JONES, H. D., Asst. Engr., Southwestern Bell Telephone Co., Topeka.

MOORE, L. P.,* Partner, Moore & Clark, Engrs., Topeka.

LOUISIANA (*Region* 6)

ALEXANDER, J. H., Sales Engr., Johnson Service Co., New Orleans.

SCHMIDT, G. A., Vice-Pres., Paramount Sheet Metal Works, Inc., Baton Rouge.

MARYLAND (*Region* 2)

JOHNSON, J. E.,* Mech. Engr., United States Air Force, Hq. Air Research & Development Command, Baltimore.

JOHNSON, L. M., Com. Sales Mgr., Minneapolis-Honeywell Regulator Co., Baltimore.

SENNER, G. J.,* Project Engr., Lloyd E. Mitchell, Inc., Baltimore.

MICHIGAN (*Region* 3)

GRAY, R. A., JR., Chief Dvlpt. Engr., Mueller Brass Co., Port Huron.

MINNESOTA (*Region* 4)

BURNHAM, C. F., Administrative Asst., Minneapolis Gas Co., Minneapolis.

GIANOS, T. C.,* Sales Engr., P. R. Reese, Inc., Minneapolis.

SKARNES, J. L., Sales Engr., Minneapolis-Honeywell Regulator Co., Minneapolis.

MISSOURI (*Region* 4)

NEISWENDER, E. A., Project Supvsr., Riggs Distler & Co., Inc., Baltimore.

NEW JERSEY (*Region* 2)

ROBINSON, K. I., Asst. to Mgr., Com. Sales, Public Service Electric & Gas Co., Newark.

NEW YORK (*Region* 1)

BLACK, R. C., Owner, R. C. Black Co., Rochester.

CASTELLO, J. V., Jr. Project Engr., Armo Cooling & Ventilating Co., Inc., New York.

CONWAY, J. F., Owner, James F. Conway Plumbing & Heating Co., Syracuse.

DRAKE, G. D., Project Engr., Norwich Pharmacal Co., Norwich.

HARVEY, E. E., Cons. Engr., Buffalo.

MORROW, R. P., Sr. Project Engr., Socony Mobil Oil Co., Buffalo.

MOTT, K. R., Field Service Repr., Servel, Inc., New York.

OHIO (*Region* 2)

ATCHISON, J. E., Dir., Service Engrg., Iron Fireman Manufacturing Co., Cleveland.

HERBRUCK, W. M.,* Owner-Mgr., Herbruck, Inc., Canton.

KAHLE, HAROLD,* Educational Dir., The Williamson Co., Cincinnati.

KASER, A. J., Mgr., Appl. Engrg., Iron Fireman Manufacturing Co., Cleveland.

KOHORST, D. G., Service and Installation Mgr., Minneapolis-Honeywell Regulator Co., Dayton.

LEE, J. G., Sales Engr., Armstrong Cork Co., Columbus.

MACDONALD, J. D., Sales Engr., Johnson Service Co., Cincinnati.

OKLAHOMA (*Region* 6)

O'HAVER, L. G., Mgr. — Partner, Bradley Mechanical Contracting, Stillwater.

Journal Section

OREGON (*Region* 5)

MCMILLAN, C. C., Br. Mgr., Merrill N. Musgrave Co., Portland.

PENNSYLVANIA (*Region* 2)

BENSON, M. A.,† Pres., Allegheny Engineering Co., Pittsburgh.

KERNEY, T. F., Cons. Engr., Philadelphia.

MILLER, S. W., JR., Chief Dvlpt. Engr., John J. Nesbitt, Inc., Philadelphia.

TAYLOR, W. G., Indus. Appl. Engr., Philadelphia Electric Co., Philadelphia.

TEXAS (*Region* 6)

BECKFORD, J. M., JR., Sales Repr., Crane O'Fallon Co., El Paso.

LANTOW, J. W., Mech. Engr., Monroe, Licht & Higgins, Archts. & Engrs., El Paso.

MCBRIDE, V. H., District Htg. & Cooling Repr., American Radiator & Standard Sanitary Corp., Dallas.

MCCALLY, J. E., Vice-Pres., C. Wallace Plumbing Co., Inc., Dallas.

MYRICK, A. R., Field Service Engr., A. M. Byers Co., Dallas.

PENN, W. R., Zone Mgr., Servel, Inc., A-C Div., Dallas.

UTAH (*Region* 5)

ROSER, R. N., Secy. & Treas., Louis A. Roser Co., Salt Lake City.

VIRGINIA (*Region* 6)

HOFFMAN, J. A., Mech. Engr., Clark, Buhr & Nexsen, Norfolk.

WASHINGTON (*Region* 5)

MCLENDON, R. T., Utilization Engr., Cascade Natural Gas Corp., Seattle.

RUCH, R. J., Sales Mgr., Consolidated Supply Co., Spokane.

CANADA (*Region* 7)

BERLIN, E. I., Mgr., Lukes Heating Equipment Co., Winnipeg, Man.

BRENAN, W. M., Mgr., Wiggs, Walford, Frost & Lindsay, Cons. Engrs., Ottawa, Ont.

DODDS, W. A., Alberta Sales Mgr., General Equipment Ltd., Edmonton, Alta.

KLASSEN, H. W., Office Mgr., Angus, Butler and Assocs., Calgary, Alta.

LAMOND, J. C., Draftsman, Warren King Ltd., Winnipeg, Man.

MURPHY, G. W., Dept. Mgr., Marshall-Wells Alberta Co. Ltd., Edmonton, Alta.

RAMMO, ERIK, Project Engr., L. H. Schwindt and Co., Burlington, Ont.

SUDBURY, J. S., Br. Mgr., Powers Regulator Co. of Canada Ltd., Ottawa, Ont.

VALLIERES, R. H.,* Engr., The Trane Co. of Canada Ltd., Montreal, Que.

COLOMBIA

DELGADO, R. E., Engr. & Dir., Carrier Corp., Cali.

Journal Section

INDIA

SUNDARARAJAN, VANKEEPURAM, Engrg. Probationer, Champion Reef Gold Mines of India, Champion Reefs P.O.

LEBANON

HAMZEH, W. Y., Mech. Engr., Mechanical Engineering Laboratories, School of Engineering, American University of Beirut, Beirut.

PERU

LEVY, JOSE, Mgr., M. & J. Levy, Lima.

Students

NORTH CAROLINA STATE COLLEGE, Raleigh, N.C. CERTIFIED BY: R. B. Knight.

CHRISTIE, J. H.	LEWIS, W. R.
GODWIN, J. C.	PACE, E. A.
HAMRICK, B. A., JR.	PACE, FINLEY, JR.
HAUSER, J. L.	SLOAN, M. K.
HUNTER, A. R.	WILLIAMS, R. P.

PURDUE UNIVERSITY, W. Lafayette, Ind. CERTIFIED BY: F. B. Morse.

KNOBEL, K. P. WALTERS, J. T.
RAMSEY, R. R.

UNIVERSITY OF MICHIGAN, Ann Arbor, Mich. CERTIFIED BY: A. B. Epple.
AKISOGLU, M. C.

UNIVERSITY OF TORONTO, Toronto, Ont., Canada. CERTIFIED BY: F. G. Ewens.
MCCUAIG, R. R.
YOUNG, GILBERT

NEW EDITION OF WELDING HANDBOOK

The *Welding Handbook*, well known as an authoritative source of welding knowledge, is being reorganized and revised. A new and radically different method of publishing the handbook has been devised. Instead of one volume, it will be divided into five sections, and one completely revised section published each year. Each section will be punched for insertion in a convenient post binder. A standing committee of the *American Welding Society* has been appointed to supervise the revision and reorganization.

MARSHALL MADE MANAGER OF G-E HEAT PUMP PLANNING

G. K. Marshall, a member of ASHAE, has been appointed manager-product planning of the Weathertron Department of General Electric Co. Mr. Marshall has long been associated with the heating and air-conditioning industry, having entered it soon after his graduation from the United States Naval Academy in 1933. He has been responsible for developing many new techniques in air-conditioning application, service, and training. As manager-product planning, he is responsible for formulating price levels and future price trends, marketing supervision of product design, and marketing forecasts.

OBITUARY

VERNON R. BROWN

Fort Worth, Tex.

From the North Texas Chapter, the Society has received word of the recent death of Vernon R. Brown, 59, house heating engineer, Lone Star Gas Co., Fort Worth.

Mr. Brown was born on December 3, 1896 at Belleville, Ont., Can. After he received his A.B. at the University of Rochester in 1922, he became a salesman for the General Gas Light Co., Pittsburgh, Pa. Previous to joining the Lone Star Gas Co. in 1930, Mr. Brown also had a few years experience as a sales engineer for the Texas Public Service Co., Austin.

A registered professional engineer in the state of Texas, Mr. Brown was a member of the Society since 1952.

IN MEMORIAM

Frank P. Keeney

Word has been received of the death at Chicago on January 9, 1956, of Frank P. Keeney, Life Member. Expressing the sense of loss felt by Officers, Council, and the members of the Society, Pres. John E. Haines made the following comments:

> "The Society has lost a long-time member, who for forty years has been a steadfast friend and an active worker, and whose unflagging interest has been manifested in many ways, including the publication of our JOURNAL for a quarter of a century. Mr. Keeney always exerted his powerful but quiet influence toward maintaining high standards of excellence in *Heating, Piping & Air Conditioning*. His kindly humor and sense of fairness were traits well known to all who came in contact with him and who enjoyed his friendship."

(Further information covering the death of Mr. Keeney appears on p. 84 of this issue of *Heating, Piping & Air Conditioning*)

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One Year: R. S. Dill, F. H. Faust, F. K. Hick, M.D., H. A. Lockhart, J. W. McElgin.

Executive: B. H. Jennings, Chairman; R. S. Dill, John Everetts, Jr., H. R. Limbacher, H. A. Lockhart.

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(61 Chapters; 1 Special Branch; 6 Student Branches)

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Arizona: 1953. Hdqrs., Phoenix. Meets, 1st Mon. PRES, W. A. Biddle, 3817 N. 15th Ave. SECY, E. P. Maxwell, 39 W. Adams St.

ARKANSAS

Arkansas: 1952. Hdqrs., Little Rock. Meets, 3rd Tues. PRES, J. L. Brown, 212 Terminal Warehouse Bldg. SECY, H. H. Himstedt, 510 E. Third St.

CALIFORNIA

Golden Gate: 1937. Hdqrs., San Francisco. Meets, 1st Thurs. PRES, D. E. McLeod, 2415 Green St. (23). SECY, Herb Duncan, 938 N. Linden Ave., South San Francisco.

Sacramento Valley: 1952. Hdqrs., Sacramento. Meets, 1st Wed. PRES, R. A. Sarro, 5412 Argo Way (21). SECY, M. J. Delavan, 405 Meister Way (19).

Southern California: 1930. Hdqrs., Los Angeles. Meets, 1st Tues. PRES, J. L. McCullough, 1978 S. Los Angeles St. (11). SECY, W. J. Biggar, 6620 Telegraph Rd. (22).

COLORADO

Rocky Mountain: 1944. Hdqrs., Denver. Meets, 1st Wed. PRES, L. L. DeLong, 2027 S. Washington St. (10). SECY, W. V. Burbank, P.O. Box 840.

CONNECTICUT

Connecticut: 1940. Hdqrs., New Haven. Meets, 3rd Thurs. PRES, E. J. Hoagland, 257 Whitney St., Hartford. SECY, J. D. Pierce, 775 Capitol Ave., Hartford.

DISTRICT OF COLUMBIA

Washington: 1935. Hdqrs., Washington, D.C. Meets, 2nd Wed. PRES, W. C. Reamy, Jr., 720 Mills Bldg. (6). SECY, S. H. Robbins, Jr., 2117 M Street, N.W. (7).

GEORGIA

Atlanta: 1937. Hdqrs., Atlanta. Meets, 2nd Mon. PRES, T. A. Barrow, Jr., 302 Ponce de Leon Ave., N.E. (8). SECY, J. A. Marshall, 1415 Howell Mill Rd., N.W.

ILLINOIS

Illinois: 1906. Hdqrs., Chicago. Meets, 2nd Mon. PRES, G. G. Freyder, 72 W. Adams St. (90). SECY, Herbert Kreisman, 117 N. Desplaines St. (6).

INDIANA

Indiana: 1943. Hdqrs., Indianapolis. Meets, 4th Tues. PRES, J. W. Jackson, 1531 N. Pennsylvania St. (2). SECY, G. W. Vogel, 31 E. Georgia St. (4).

IOWA

Iowa: 1940. Hdqrs., Des Moines. Meets, 2nd Tues. PRES, G. J. Kraai, 907 Sixth Ave. (14). SECY, W. A. Schworm, Physical Plant Dept., Iowa State College, Ames.

KANSAS

Kansas: 1951. Hdqrs., Wichita. Meets, Tues. after 1st Mon. PRES, A. B. Newton, 3511 Elmwood Dr. (17). SECY, T. L. Roberts, 2008 S. Parkwood Lane (18).

KENTUCKY

Bluegrass: 1954. Hdqrs., Louisville. Meets, 2nd Mon. PRES, W. M. Pace, 218 Don Allen Rd. (7). SECY, R. B. Duggan, 41 Beechwood Rd., Jeffersonville, Ind.

LOUISIANA

Baton Rouge: 1955. Hdqrs., Baton Rouge. Meets, 3rd Wed. PRES, C. S. Woodruff, P.O. Box 358. SECY, A. J. Mayers, Jr., 7732 Goodwood Ave.

Delta: 1939. Hdqrs., New Orleans. Meets, 3rd Tues. PRES, W. B. Martin, Jr., 635 Commercial Pl. (12). SECY, R. K. Goode, 4052 Thalia St. (25).

Shreveport: 1948. Hdqrs., Shreveport. Meets, 3rd Thurs. PRES, R. S. Segall, 848 River Rd. SECY, A. L. Jones, Jr., 753 Gladstone.

MARYLAND

Baltimore: 1949. Hdqrs., Baltimore. Meets, 3rd Wed. PRES, E. J. Morris, 813 N. Calvert St. (2). SECY, E. J. Dull, 1122 N. Charles St. (1).

MASSACHUSETTS

Massachusetts: 1912. Hdqrs., Boston. Meets, 3rd Tues. PRES, G. D. File, 79 Milk St. SECY, R. F. Curry, 80 Ripley St., Newton Centre (59).

Western Massachusetts: 1955. Hdqrs., Springfield. PRES, R. E. Cross, 114 Boston Rd. SECY, F. A. Ferraro, 172 Chestnut St.

MICHIGAN

Michigan: 1916. Hdqrs., Detroit. Meets, 1st Mon. after 10th of month. PRES, D. S. Falk, 4864 Woodward Ave. (1). SECY, J. H. Spitzley, 1200 W. Fort St. (26).

Western Michigan: 1931. Hdqrs., Grand Rapids. Meets, 2nd Mon. PRES, S. M. Paganelli, 47 N. Division Ave. SECY, B. J. Walter, 333 Fuller Ave., N.E.

MINNESOTA

Minnesota: 1918. Hdqrs., Minneapolis. Meets, 1st Mon. PRES, J. S. Locke, 2753 Fourth Ave., S. (8). SECY, F. G. Vogt, 6530 W. Lake St. (16).

MISSISSIPPI

Mississippi: 1953. Hdqrs., Jackson. Meets, 4th Mon. PRES, B. L. Palmer, 1808 N. Mill St. (2). SECY, M. F. Knipp, Jr., 2858 Arbor Hill Dr. (4).

MISSOURI

Kansas City: 1917. Hdqrs., Kansas City. Meets, 1st Mon. PRES, A. S. Hurt, Jr., 3601 E. 18th St. (27). SECY, S. C. McCann, 210 W. Tenth St. (5).

St. Louis: 1918. Hdqrs., St. Louis. Meets, 2nd Tues. PRES, E. T. Clucas, 4354 Olive St. SECY, N. J. Hubbuch, Jr., 7020 Cornell, University City (5).

NEBRASKA

Nebraska: 1940. Hdqrs., Omaha. Meets, 2nd Tues. PRES, T. E. Davis, 4303 Dodge St. SECY, C. A. Faller, 1802 Mason St. (2).

NEW JERSEY

North Jersey: 1952. Hdqrs., Newark. Meets, 2nd Tues. PRES, C. H. Smith, 2300 N. Stiles St., Linden. SECY, M. C. Christesen, 196 Everett Pl., Englewood.

NEW MEXICO

New Mexico: 1954. Hdqrs., Albuquerque. Meets, 3rd Mon. PRES, H. F. Munn, 419 Granite, N.W. SECY, J. K. James, 4462 Avenida del Sol.

NEW YORK

Central New York: 1944. Hdqrs., Syracuse. Meets, 4th Wed. PRES, L. A. Childs, 308 Forest Hill Dr. (6). SECY, Merle Weninger, 230 Goodrich Ave. (5).

Empire State Capital: 1951. Hdqrs., Albany. Meets, 2nd Wed. PRES, L. V. Appleby, N. Pearl & Van Woert Sts. (4). SECY, E. J. Mahoney, 45 Colvin Ave.

New York: 1911. Hdqrs., New York. Meets, 3rd Mon. PRES, Albert Giannini, 385 Madison Ave. (17). SECY, Carl H. Flink, 62 Worth St. (13).

Western New York: 1919. Hdqrs., Buffalo. Meets 2nd Mon. PRES, C. W. Kaupp, 271 Delaware Ave. (2). SECY, J. P. Guerra, 34 E. Depew Ave. (14).

NORTH CAROLINA

Northern Piedmont: 1952. Hdqrs., Greensboro. Meets, 2nd or 3rd Fri. PRES, L. R. Gorrell, 1412 Chester Rd., Raleigh. SECY, C. E. Amick, 1042 Oakmont Ave.

Southern Piedmont: 1952. Hdqrs., Charlotte. PRES, L. F. Lawrence, Jr., 212 Greystone Rd. SECY, G. C. Garrett, P.O. Box 3697.

OHIO

Central Ohio: 1944. Hdqrs., Columbus. Meets, 3rd Mon., PRES, R. A. Wilson, 2240 N. High St. SECY, T. R. Walker, 182 N. Yale Ave.

Cincinnati: 1932. Hdqrs., Cincinnati. Meets, 1st Tues. PRES, A. H. Gerdsen, 224 E. Second St. (2). SECY, T. D. Reiley, 1905 Dunlap St. (14.)

Miami Valley: 1950. Hdqrs., Dayton. Meets, 1st Wed. PRES, D. E. Tullis, 1720 Parkhill Drive (6). SECY, L. P. Brehm, Jr., 111 S. Broomfield Rd.

Northern Ohio: 1916. Hdqrs., Cleveland. Meets, 2nd Mon. PRES, L. C. Burkes, 1792 E. 40th St. SECY, R. A. Urban, Sr., 1740 E. 12th St. (14).

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OKLAHOMA

Oklahoma: 1935. Hdqrs., Oklahoma City. Meets, 2nd Mon. PRES, J. R. Patten, 1726 N.W. Fifth (6). SECY, A. C. Shelley, 2946 Nimitz (12).

Northeastern Oklahoma: 1948. Hdqrs., Tulsa. Meets, 2nd Tues. PRES, H. W. Meinholtz, Box 2261. SECY, H. L. Cauvel, 3629 S. New Haven.

OREGON

Oregon: 1939. Hdqrs., Portland. Meets, Thurs. after 1st Tues. PRES, Dick Blankenship, Cascade Bldg. (4). SECY, W. B. Hayes, 707 Portland Trust Bldg. (4).

PENNSYLVANIA

Philadelphia: 1916. Hdqrs., Philadelphia. Meets, 2nd Thurs. PRES, A. M. Robertson, 1200 Locust St. (7). SECY, R. J. Sigel, 822 Montgomery Ave., Narberth.

Pittsburgh: 1919. Hdqrs., Pittsburgh. Meets, 3rd Mon. PRES, C. L. Benn, 420 Blvd. of Allies (19). SECY, E. H. Riesmeyer, Jr., 231-33 Fort Pitt Blvd. (22).

SOUTH CAROLINA

South Carolina: 1954. Hdqrs., Columbia. PRES, R. K. Rouse, P.O. Box 3731, Greenville. SECY, B. A. Leppard, P.O. Box 3353, Station A, Greenville.

TENNESSEE

Memphis: 1944. Hdqrs., Memphis. Meets, 3rd Mon. PRES, John Hilton, II, 4443 Sequoia. SECY, L. V. Eberle, Jr., 1358 Clementina.

TEXAS

North Texas: 1938. Hdqrs., Dallas. Meets, 3rd Mon. PRES, H. G. Gregerson, 4512 Livingston (5). SECY, Ross Zumwalt, 929 Mercantile Securities Bldg. (1).

South Texas: 1938. Hdqrs., Houston. Meets, 3rd Fri. PRES, F. M. Nell, P.O. Box 13197 (19). SECY, A. B. Ullrich, 2520 Huldy St. (19).

Southwest Texas: 1946. Hdqrs., San Antonio. Meets 3rd Tues. PRES, F. B. Frazee, 1013 Riverside Dr., Austin (4). SECY, J. L. Rea, Jr., 300 West 8th St., Austin.

West Texas: 1953. Hdqrs., Lubbock. Meets, 1st Tues. PRES, R. S. Carow, P.O. Box 3206. SECY, H. L. Mayes, P.O. Box 151.

UTAH

Utah: 1944. Hdqrs., Salt Lake City. Meets, 3rd Thurs. PRES, R. C. Evans, 2549 Wilmington Ave. (6). SECY, G. E. Wright, Jr., Dooly Bldg.

VIRGINIA

Virginia: 1946. Hdqrs., Norfolk. Meets, 3rd Wed. PRES, T. B. Carpenter, 8400 Millard St. SECY, C. G. Conaway, Jr., 4701 Colley Ave. (5).

WASHINGTON

Inland Empire: 1950. Hdqrs., Spokane. Meets, 1st Mon. PRES, F. W. Jenkinson, 228 Hutton Bldg. SECY, J. A. Doyle, W. 3018 Broad.

Pacific Northwest: 1928. Hdqrs., Seattle. Meets, 2nd Tues. PRES, P. I. L. Winsor, 20031 Marine View Dr., S.W. (66). SECY, M. W. McKinstry, 4017 McGilvra St. (2).

WISCONSIN

Wisconsin: 1922. Hdqrs., Milwaukee. Meets, 3rd Mon. PRES, I. J. Rossiter, 231 W. Wisconsin Ave. (3). SECY, R. D. Rodwell, 152 W. Wisconsin Ave. (3).

CANADA

British Columbia: 1952. Hdqrs., Vancouver. Meets, 2nd Wed. PRES, Cornelius Van Boeyen, 636 Drake St. (3). SECY, A. C. Martin, 425 W. Second Ave.

Manitoba: 1935. Hdqrs., Winnipeg. Meets, 4th Thurs. PRES, G. C. Davis, 212 Waverly St. (9). SECY, A. H. Millar, 342 Mandeville St., St. James (12).

Montreal: 1936. Hdqrs., Montreal. Meets, 3rd Mon. PRES, R. J. Ker, 5000 Namur St. (9). SECY, W. E. Jarvis, P.O. Box 61.

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Ottawa Valley: 1952. Hdqrs., Ottawa. Meets, 3rd Tues. PRES, E. J. Schoenherr, 32 Clarey Ave. (1). SECY, C. W. Watson, 102 Bank St.

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North Carolina State College: 1948. Hdqrs., Raleigh. PRES, R. E. Crawford, 106½ Logan Ct. SECY, S. R. Moore, Box 4317, State College.

Oregon State College: 1949. Hdqrs., Corvallis. Meets, 1st Wed. after 1st Tues. PRES, P. I. Anderson, 202 N. 10th. SECY, D. W. Strahan, 233 Mall St.

Purdue University: 1948. Hdqrs., W. Lafayette, Ind. PRES, D. B. Doucette, Purdue Student Branch, ASHAE, School of Mech. Engrg. SECY, J. W. Deabler, Purdue Student Branch, ASHAE, School of Mech. Engrg.

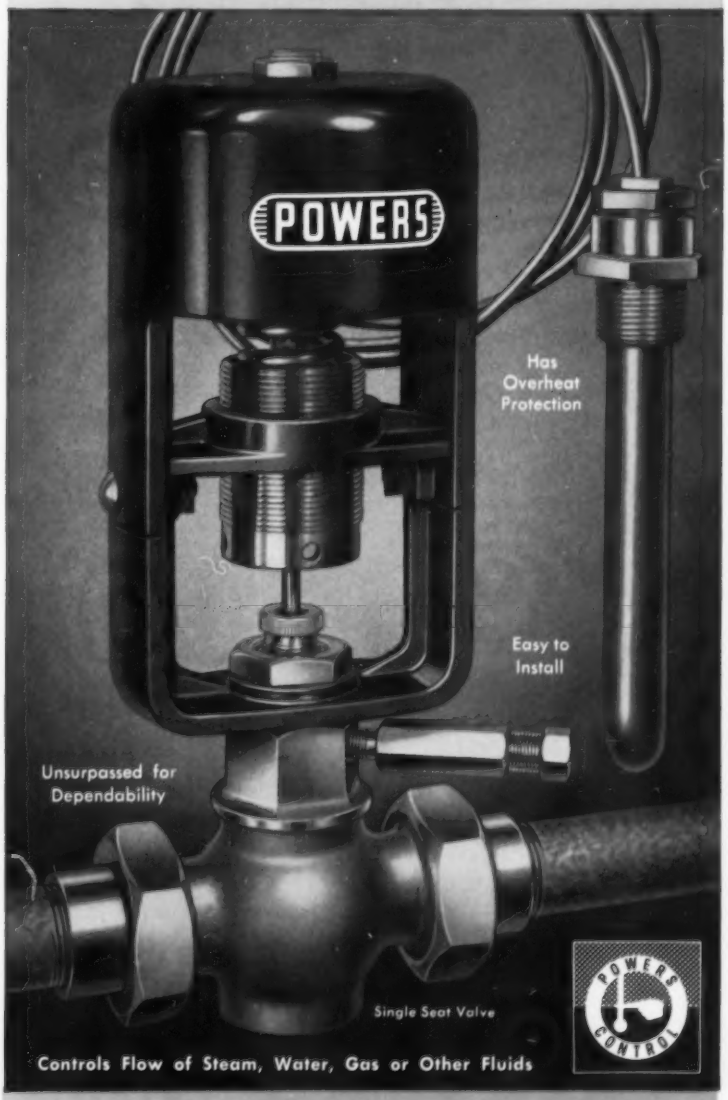
Texas A. & M. College: 1946. Hdqrs., College Station. Meets, 2nd and 4th Tues. PRES, D. F. Carroll, Box 6264. SECY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.

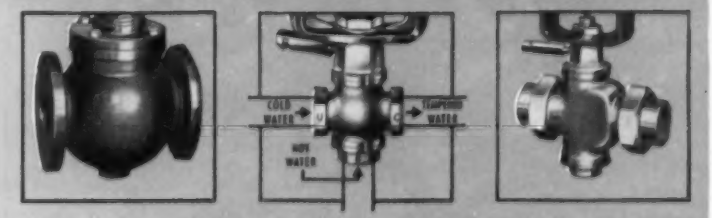
University of Detroit: 1949. Hdqrs., Detroit. Meets, 1st Tues. PRES, L. J. Hayes, Jr., 16254 Santa Rosa Dr. (21). SECY, E. F. Hoelscher, Jr., 14283 Cherrylawn (38).

University of Toronto: 1951. Hdqrs., Toronto. PRES, W. A. Stewart, 86 Roxborough St., W. (5). SECY, R. M. Davies, 144 Manor Rd., E.

POWERS No. 11 Self-Operating TEMPERATURE REGULATOR

Automatically holds temperature constant at the right point. Prevents losses caused by wasteful OVER-heating.



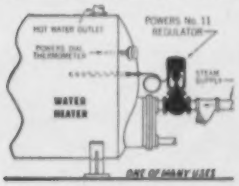


Various Valve Bodies and Inner Valves are available. Single and Double Seat Valves thru 2" have rugged bronze bodies with bronze union connections for quick, easy installation. Bulletin 329 gives information about all types.

(488)

Why It Gives BETTER CONTROL and Saves More Money

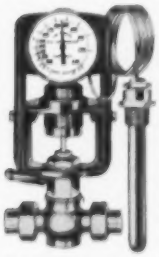
Often repays its cost 3 to 6 times a year when used on:



- Water Heaters
- Industrial Processes
- Heat Exchangers
- Fuel and Crude Oil Heaters
- Air Compressors Diesel Engines

ONLY POWERS No. 11 REGULATOR Offers ALL These Advantages

- **Simple, sturdy construction.** Materials used are corrosion resistant.
- **Powers bellows has 50% more power** than used in the majority of regulators. The heart of a self operating regulator is its bellows. Powers with its 50% greater effective area gives better control and its durable 2 ply bellows outlasts ordinary single ply bellows.
- **Valve stem lubricator** with silicone grease aids easy movement of highly polished stainless steel valve stem and reduces drying out of packing.
- **BETTER CONTROL** results from Powers powerful bellows and minimum of valve stem friction.
- **60°F. temperature ranges** available with accuracy of ±1°F. on some processes and 2 to 3°F. on others.
- **Rugged bronze valve bodies with bronze union connections,** for single and double seat valves thru 2", reduce installation time and labor. Larger sizes have flanged iron body valves.
- **Powers Nationwide Service and 24 Hour Delivery** in the U.S.A. are important time and money saving advantages.



- **Indicating Regulator** with easy to read 4" dial thermometer helps adjust the regulator and check temperature at the bulb. Various dials and ranges are available.

Right type and size of valve is important for good control. May we help you make the right selection? Benefit from POWERS more than 60 years experience with self-operating regulators.

Call our nearest office or write us direct for Bulletin 329.

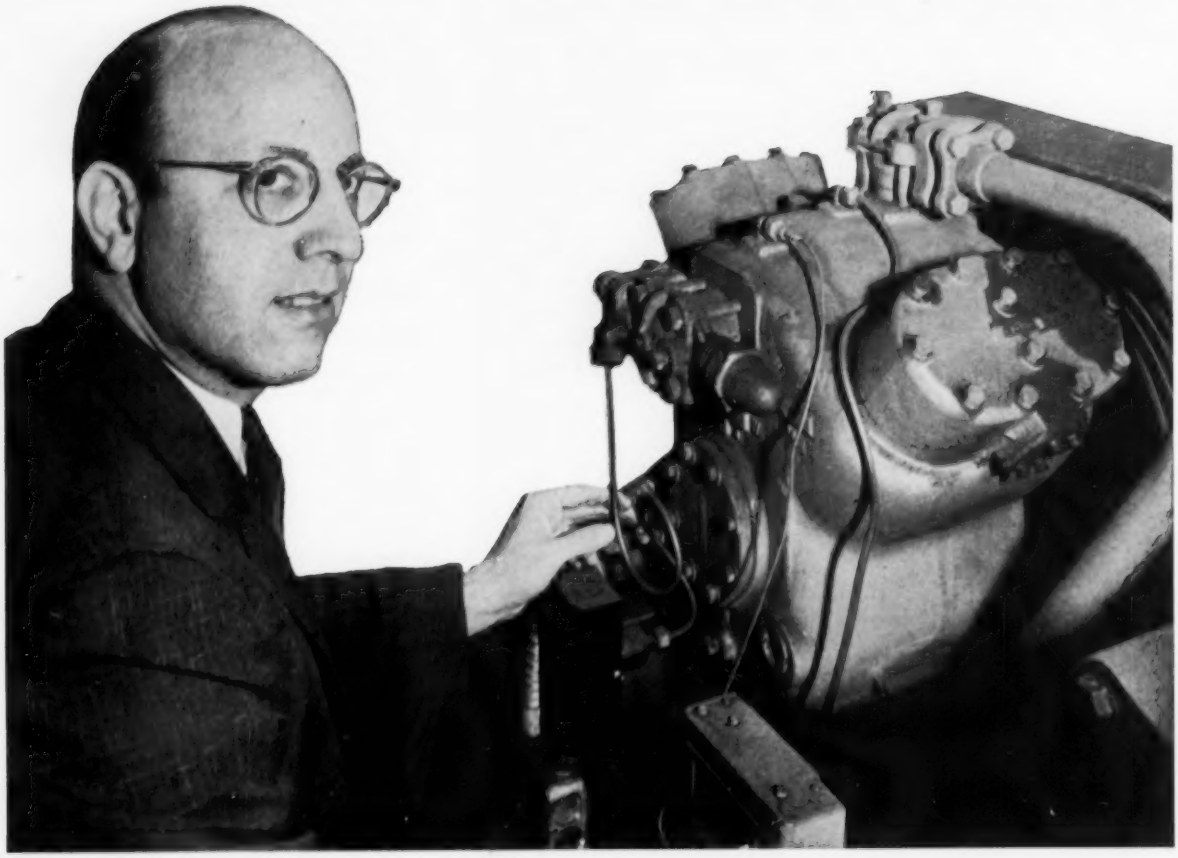
THE POWERS REGULATOR CO.

Skokie, Ill. | Offices in Chief Cities in U.S.A. Canada and Mexico | See your phone book

Automatic Temperature and Humidity Control

Established 1891

"COMPLETELY DEPENDABLE"



"'Freon'* is trouble-free

We stake our reputation on it"

—says Mr. Robert Greenwald, Manager, Air Conditioning Div., The Lumm Corp., Toledo, Ohio

"In this business, the only way to keep a reputation for quality installations the way we have is to use the best materials. That includes 'Freon' refrigerants," says Mr. Greenwald. "I've been in the air conditioning business for 11 years and I don't know of a better refrigerant. Our air conditioning installations depend on 'Freon' refrigerants."

YOU CAN DEPEND ON "FREON"

You can get a dependable "Freon" refrigerant for any air conditioning or refrigeration application. "Freon" is your best refrigerant buy, because it's dry, pure and safe. Has been ever since Du Pont started making it nearly 25 years ago. Ask your wholesaler for "Freon" refrigerants made by Du Pont—the name you can depend on.

For more information write to E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Division, Wilmington 98, Delaware.

KINETIC

1931 1956

25 YEARS OF

FREON

REG. U. S. PAT. OFF.

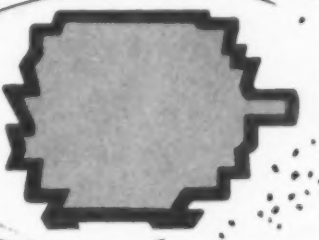
SAFE REFRIGERANTS

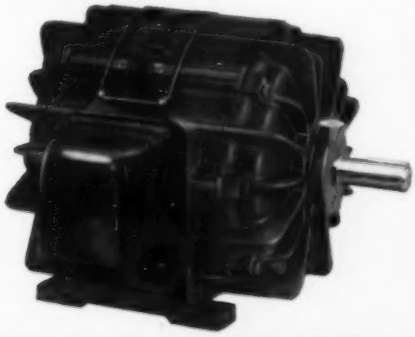
*"Freon" is Du Pont's registered trade-mark for its flourinated hydrocarbon refrigerants.

DU PONT

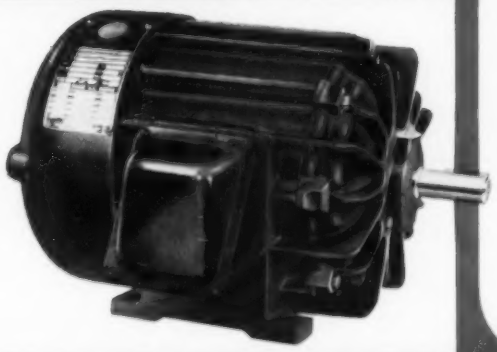
Better Things for Better Living...through Chemistry

DUST-PROOF!
MOISTURE-PROOF!





TWO NEW
"DIEHL MOTORS FOR
Air-Over-Motor"
APPLICATIONS



Tops in Quality — Competitive in price!

When you buy or specify motors for fans, blowers, unit heaters, air conditioners, cooling towers or dehumidifying systems *don't overlook* these two new standard or custom-designed Diehl Totally-Enclosed Motors.

Smaller in size, lighter in weight, precision-engineered and precision-built to new NEMA standards, they are ideally suited to "air-over-motor" applications where moisture, fumes, dust and other airborne particles are a problem . . . a field in which Diehl has long been a leader.

Diehl

Tops in Quality—
Competitive in price!

DIEHL MANUFACTURING COMPANY
Electrical Division of THE SINGER MANUFACTURING COMPANY
Finderne Plant, SOMERVILLE, N. J.

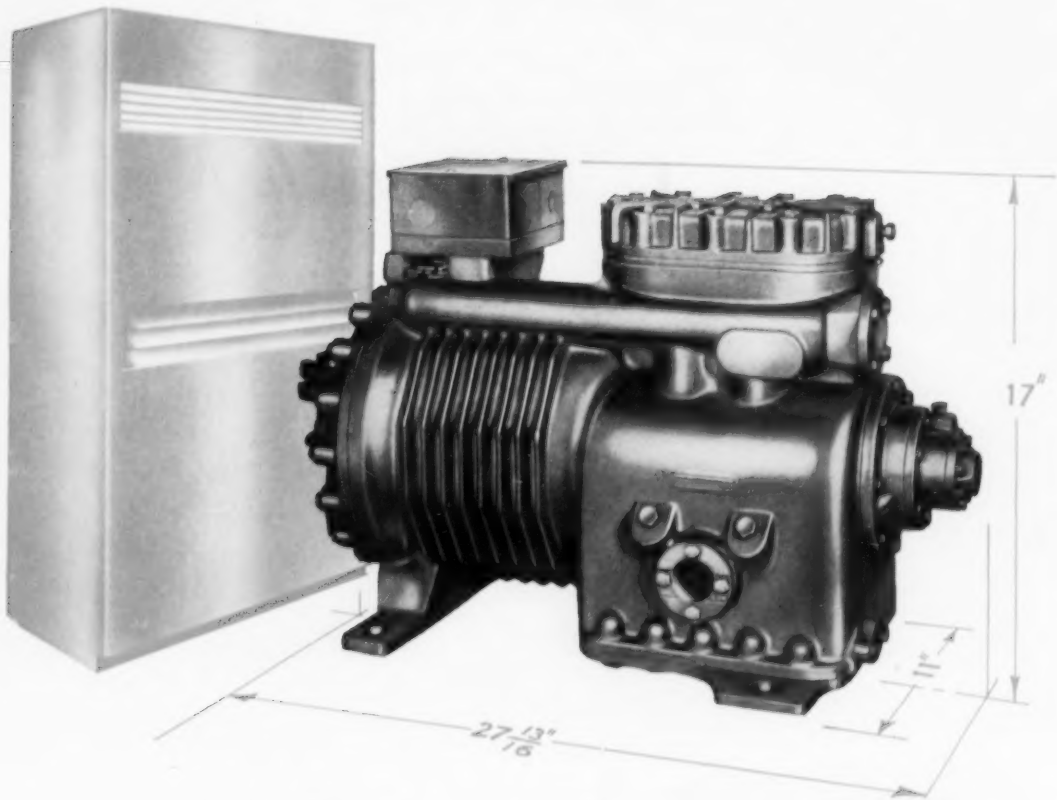
Please send me the following bulletins:

☐ New Type "D" Motor Bulletin No. HP-3304
☐ Consolidated Catalog & Price List No. HP-3310

Name_____
Company_____
Street_____
City_____ State_____

INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES

NEW... *Quiet, efficient, power-packed*



10 H.P. *Copelametic*

FOR... PACKAGED AIR CONDITIONING

There was plenty of interest in this 10 H.P. Copelametic when we introduced it at the ARI Show in Atlantic City. Many features make it ideal for quality, packaged air conditioning.

The 10 H.P. Copelametic motor-compressor fits neatly into a compactly designed unit. For greater capacity, two motor-compressors can be installed for flexibility in operation.

Use of suction cooling and Freon-22 give the 10 H.P. Copelametic high capacities with low power input. As in all time-proved Copelametics, belts, seals and manual oiling are eliminated. Being accessible, adjustments and parts replacement can be made on the spot with minimum loss of operating time.

Everything required in package air conditioning is featured in the 10 H.P. Copelametic. It is compact . . . rugged . . . efficient . . . quiet-running . . . accessible. It has the protection of positive lubrication.

A comprehensive, detailed engineering packet describing the 10 H.P. is available. SEND FOR YOURS.

SINCE 1918

Copeland REFRIGERATION CORPORATION, Sidney, Ohio

Sarco Condensate and Vacuum Pumps give you this big advantage...

UNDIVIDED RESPONSIBILITY
by Sarco for pumps as well as heating specialties!

Now Sarco expands its extensive heating line... by adding *condensate and vacuum pumps*... offering you in still larger measure the protection and convenience of *undivided responsibility*.

Shown above is one of the many Sarco pumps... it's the streamlined Sarco type S condensate pump. Designed and built to Sarco's traditionally high quality standards, it assures you top performance and long, trouble-free life. The many advantages include:

...Low 7½" inlet... Close coupling... No sub-base needed. Inspection? Just unscrew 3 nuts and lift the motor; no need to disconnect the piping. For a complete list of features, mail the coupon today.

Selection — The experienced Sarco-Sarcotherm engineering staff will gladly help you select the right Sarco condensate or vacuum pump for each job.

Undivided Responsibility — From *one* reliable "Complete Line" source... SARCO-SARCOTHERM ...get not only condensate and vacuum pumps but also heating specialties, steam traps, temperature regulators, finned-tube radiation, and weather-compensated control systems for steam and hot water heating.

SARCO—SARCOTHERM

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Sarco Company, Inc.
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Please send me:

☐ Bulletin on New Sarco type S Condensate Pumps.

☐ Bulletin on all Sarco Vacuum and Condensate Pumps.

Name_____
Firm_____
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JENKINS Fig. 106-A

The FIRST
Renewable Composition Disc
BRONZE GLOBE VALVE
150 lbs. Steam 300 lbs. O.W.G.
⅛ in. to 3 in.

Making a Work Horse a Champion

Take a Fig. 106-A apart. It's easy to see the reason why it's the "champion" of disc-equipped Bronze Globes. Every part, from heatproof handwheel to pipe ends, reflects the design and construction skill of generations of Jenkins Valve specialists.

Jenkins Bros. introduced the first renewable composition disc Globe . . . is still the only manufacturer of both valves *and* discs.

Fig. 106-A not only looks better — it proves out better in performance. In any comparison, its long-life, low-upkeep record has always set the standard. That is the true measure of valve cost — and it is the reason why industry's shrewdest buyers will settle for nothing less than Fig. 106-A quality.

The Fig. 106-A "family", with interchangeable parts, provides Globe, Angle, and Check patterns to meet 90% of average valve needs.

Ask your Jenkins Distributor for full information, or write: Jenkins Bros., 100 Park Ave., New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros.

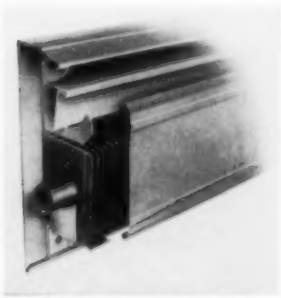
SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

EQUIPMENT DEVELOPMENTS

For reviews of Recent Trade Literature see Page 212

Heat Exchange Surface . . .

. . . for air conditioning, refrigeration—Revere Copper and Brass, Inc., 230 Park Ave., New York 17. Is mill product in form of single strip or sheet of solid copper, brass or aluminum in which tubes are inflated to desired running lengths in variety of shapes, sizes. Except for expandable portions, product is solid strip of metal derived from treated casting rather than two pieces brazed, welded, rolled together. Can be stamped or drawn to desired shapes prior to expansion of channels, says company, and tubes can be spaced as close as ¼ in.

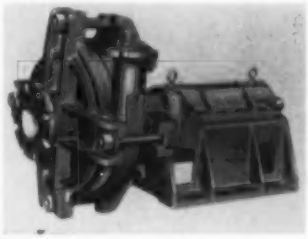


Baseboard Radiation . . .

. . . for forced hot water heating systems—Standard Fin Pipe Radiator Corp., Clinton, Mass. For flush, recessed installation. Enclosures 9½ in. high, extend 2¼ to 3 in. into room. Front cover plate snaps off for cleaning. With damper for individual room control. Assemblies in 4, 5, 6 ft lengths. Includes backing plate, cradle hangers, brackets, damper cover plate, joining piece, radiation element.

Air Conditioners . . .

. . . with "building block" design—Carrier Corp., Syracuse 1. "Modular Weathermaster" designed to meet needs of newer glass wall architectural designs of multi-story buildings, also reduce installation costs in older buildings. In floor mounted or wall suspended models. Three methods of controlling units available—pneumatic, self contained, manual.

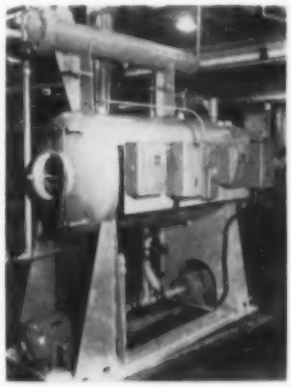


Pump . . .

. . . designed for easy maintenance—Morris Machine Works, Baldwinsville, N. Y. Low speed, continuous duty unit for handling abrasive slurries of cement, sand, coal, solids, chemical sludges, other products up to maximum fluid consistency under suction lift or positive head. In seven models 2 to 6 in. size. By removing four bolts, unit can be opened for most maintenance requirements without disturbing piping, says company.

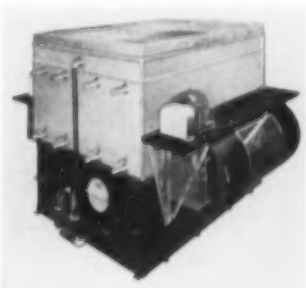
Segregating Valve . . .

. . . designed to provide tight shutoff in materials handling lines—Allen-Sherman-Hoff Co., 259 E. Lancaster Ave., Wynnewood, Pa. Slide gate type unit designed for manual or automatic operation. Can be installed in branch lines to cut off inactive portions of system, or at other points to isolate a portion, says company. Cited features: provides tight shutoff; is nonclogging; prevents excessive wear on gate or seat; has enclosed, dustproof slide. In 4, 5, 6, 8, 10, 12 in. sizes.



Return System . . .

. . . for packaged boilers—Patterson-Kelley Co., Inc., 730 Burson St., East Stroudsburg, Pa. Engineered to utilize heat energy from high pressure condensate to preheat incoming water for processing. Also reheats condensate, plus make-up water, returns it to boiler. Unit comprised of condensate cooler and receiver, feedwater heater, controls, pumps, piping, accessories. Designed to be piped to steam, condensate, water lines.

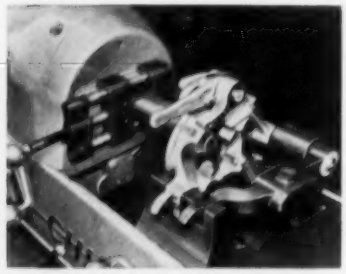


Condensers, Towers . . .

. . . with 350, 400 ton nominal capacities, respectively—Baltimore Aircoil Co., Inc., 2615 Mathews St., Baltimore 18. Units designed to require minimum installation space. Employing galvanized centrifugal fans, equipment engineered around blow-through principle. Water drip noise is said to have been almost eliminated. Shown is model "MC" evaporative condenser.

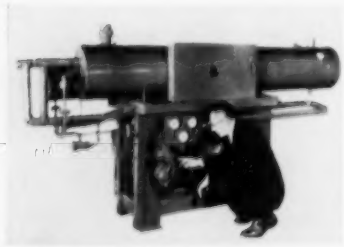
EQUIPMENT DEVELOPMENTS

Continued



Scroll Type Die Head . . .

. . . in monotype, duotype, quadra-type models designed for precision head cutting—Gaines-Collins, 5474 Alhambra Ave., Los Angeles 32. Available for company's "Chief" portable pipe, conduit, bolt threader. "Chief" comes equipped with three duotype cast die heads, three sets of dies for threading ½ to 2 in. pipe. Frame type die head with reamer available as optional equipment. Both type die heads have built-in oil lines connected to automatic pump.

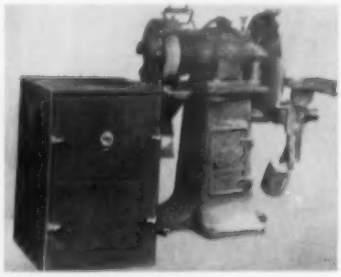


Packaged Chillers . . .

. . . with 15 to 300 ton capacity range—Acme Industries, Inc., Jackson, Mich. In two series: "C" series "Flow-Therm" is complete with compressor, has capacities 20 to 175 tons; "R" series, for remote compressor mounting, has 15 to 300. "C" series units, designed especially for newer refrigerants, include compressor, motor, chiller, condenser, heat exchanger, necessary controls. Engineered for flexibility of installation, "R" series includes compressor ready for mounting anywhere, says company. Single, dual circuits available. Two mounting variations designed to fit floor space, head room.

Insulation . . .

. . . of laminated aluminum foil—Infra Insulation, Inc., 525 Broadway, New York 12. Barrier to heat and vapor flow, condensation formation is said to have 97 percent reflectivity for heat, radiation. Fabricated to open into multiple layers of aluminum, fiber and reflective air spaces. Recommended by company for factories, hospitals, stores, schools, etc., where insulation is left exposed after installation. Available in 16, 20, 24 in. widths.



Dust Collector . . .

. . . with increased horsepower rating—Torit Mfg. Co., 287 Walnut St., St. Paul 2. Raised to ¾ hp. For use with double end pedestal grinders with wheels to 10 in. diameter, single spindle disc grinders or sanders to 18 in. diameter, tool and cutter grinders, polishing and buffing wheels, etc. Unit has 24 cloth filters to provide 60 sq ft of filtering area. Available with internally mounted motors—60 cycle, 110/220 volt, single-phase or 220/440 volt, three-phase.

Packaged Chiller . . .

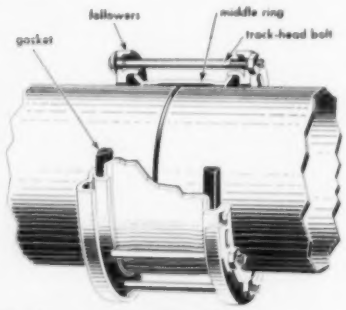
. . . designed for quiet operation—Acme Industries, Inc., Jackson, Mich. In six models with capacities 3 to 20 tons. Requires no cabinet, other special enclosure. Compressor balanced to minimize vibration, facilitate quietness, says company.

Iron Powder Electrode . . .

. . . for maintenance, repair welding—Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17. "Jet-Hard BU-90" designed for fast build-up of worn parts at low cost. For operation on d-c, electrode negative, or a-c. Available in 5/32, 3/16, ¼ in. sizes.

Static Balancing . . .

. . . machines in two vertical models—Balance Engineering Co., 850 W. Lake St., Chicago 7. Model "201-VL" has weight capacities 1 to 20 lb, is designed to handle diameters to 20 in. "201-VH" handles 5 to 75 lb, diameters to 20 in. Recommended by company for balancing impellers, blower wheels, flywheels, fans, pulleys, other parts having no integral shaft.

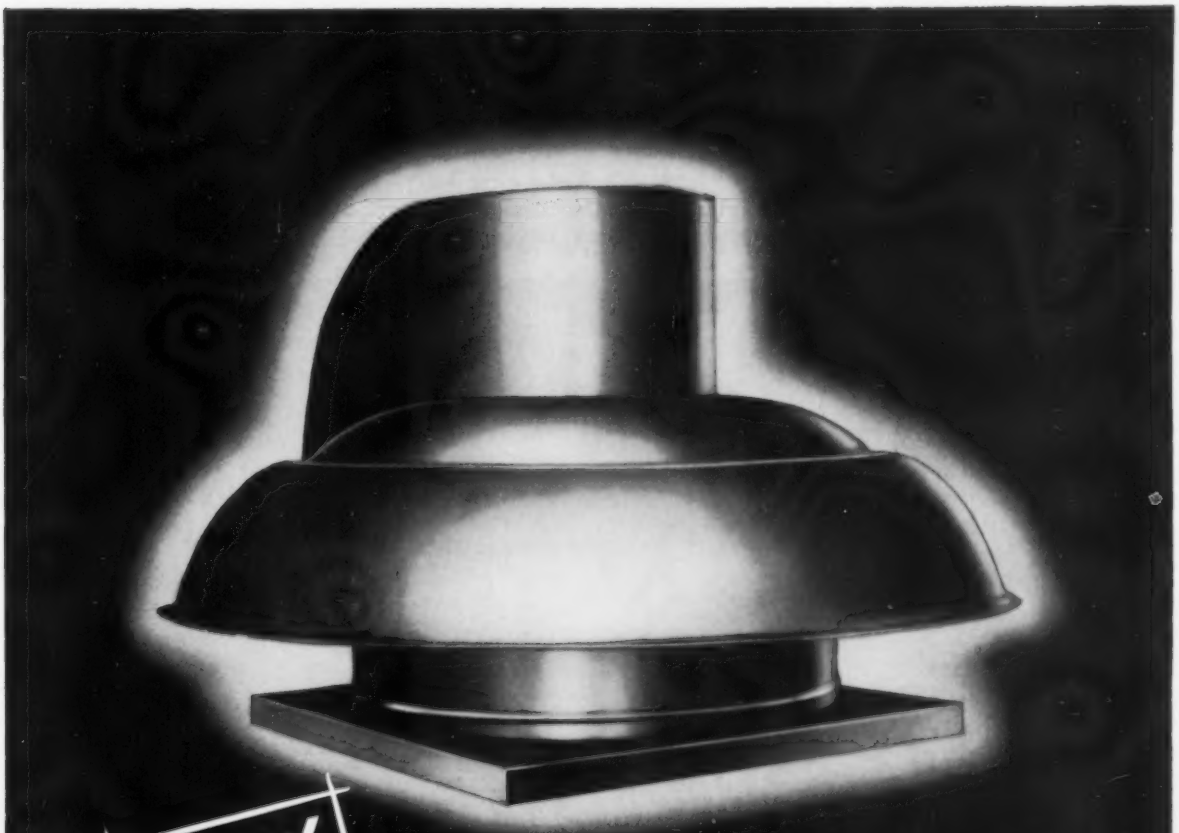


Piping, Accessories . . .

. . . for materials handling—Allen-Sherman-Hoff Co., 259 E. Lancaster Ave., Wynnewood, Pa. "Ashcolite" line includes metal pipe with sleeve couplings, accessories for hydraulic or pneumatic materials handling systems. Is said to have high abrasion resistance, uniform composition of pipe, true dimensions of pipe diameter and wall thickness, simplified coupling arrangement to provide easy installation and maintenance.

Max. Pressure Gage . . .

. . . designed to relieve serviceman of constant gage watching and give visual proof of maximum pressure reached over given period of time—Jas. P. Marsh Corp., Skokie, Ill. By means of check valve, pressure ap-



new!

CENTRIFUGAL ROOF VENTILATOR . . . WHISPER QUIET, LOW SILHOUETTE

For whisper-quiet operation. Running at low tip speeds, moves large volumes of air efficiently against static pressure. Low in silhouette, distinctively profiled, blends well with modern architecture. Send for new 16-page catalog which also contains a section, "How to Select a Roof Ventilator."

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☐ Yes, please send me catalog on your new Centrifugal Roof Ventilator.

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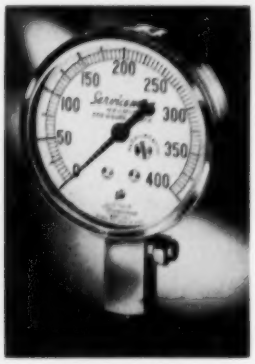
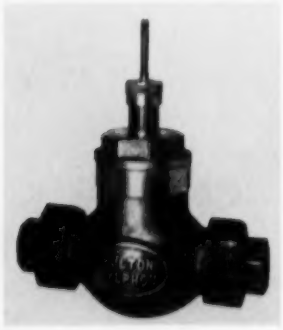
EQUIPMENT DEVELOPMENTS

Continued



plied is trapped inside bourdon tube and indicating hand is stopped on dial at point of maximum pressure. Recommended by company for checking air conditioning systems, balancing refrigeration systems, industrial processes where maximum pressures important factors.



Valve . . .

. . . for "dead end" service—Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Box 400, Knoxville. Type "MA" valve recommended by company for applications on medium, high pressure pipelines for difficult shutoff service. In sizes ¾ to 2 in. Sizes ¾ to 1½ in. have union ends; 2 in. have flanged ends.

Wall Rack . . .

. . . for holding plans—Plan Hold Div., Air Comfort Co., South Gate, Calif. Brackets pivoted within wall plate support "Plan Holds," which are equipped with "slide-over" clips. Brackets swing back and forth so reference readily available to either side of plans, says company.

Room Air Conditioner . . .

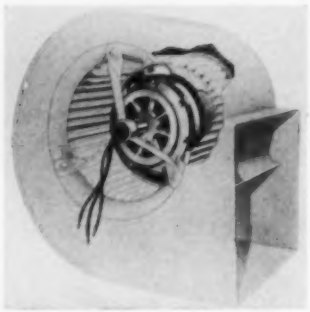
. . . designed for high capacity operation under hottest weather—Carrier Corp., Syracuse 1. "International" line, available in ½, ¾, 1, 1½ hp units, recommended for use here and abroad. Is said to operate at high efficiency under low voltage conditions.

50 Kvar Capacitor . . .

. . . with altered dimensions to fit racks designed for 25 kvar units—General Electric Co., Schenectady 5, N. Y. With same base dimensions, capacitors are 11 in. taller than 25 kvar units, weigh less than twice as much, says company.

Tachometer . . .

. . . with overspeed, underspeed controls—Metron Instrument Co., 432 Lincoln St., Denver 3. Recommended by company for sounding alarms, turning on light signals, stopping or starting equipment, opening or closing valves, controlling speeds, etc. High, low limit pointers independently adjustable. Pointers act as single pole double throw switch with regular speed pointer as switch center arm.



Blower Motor . . .

. . . with integral drive—Iron Fireman Mfg. Co., Electronics Div., 2838 S. E. Ninth Ave., Portland Ore. Rotor is on outside and revolves around stationary shaft and field coil assembly. Flange on rotor connects directly to blower wheel, in effect making motor integral part of wheel. Eliminates need for belts, pulleys, special motor mounts, company says. Present production models rated ¼ hp. Are designed 9 in. and some 10 in. blowers on 115 volts, 60 cycles.

Elbow, Bellows . . .

. . . molded from fluorocarbon resins for applications involving acids and caustics, foods and drugs, steam, synthetic oils under high temperatures—Resistoflex Corp., 39 Plansoen St., Belleville, N. J. Elbow has short radius construction, is available in 45, 90 deg types. Bellows and expansion joint in 1, 1½, 2, 3 in. diameters. May also be custom fabricated to order.

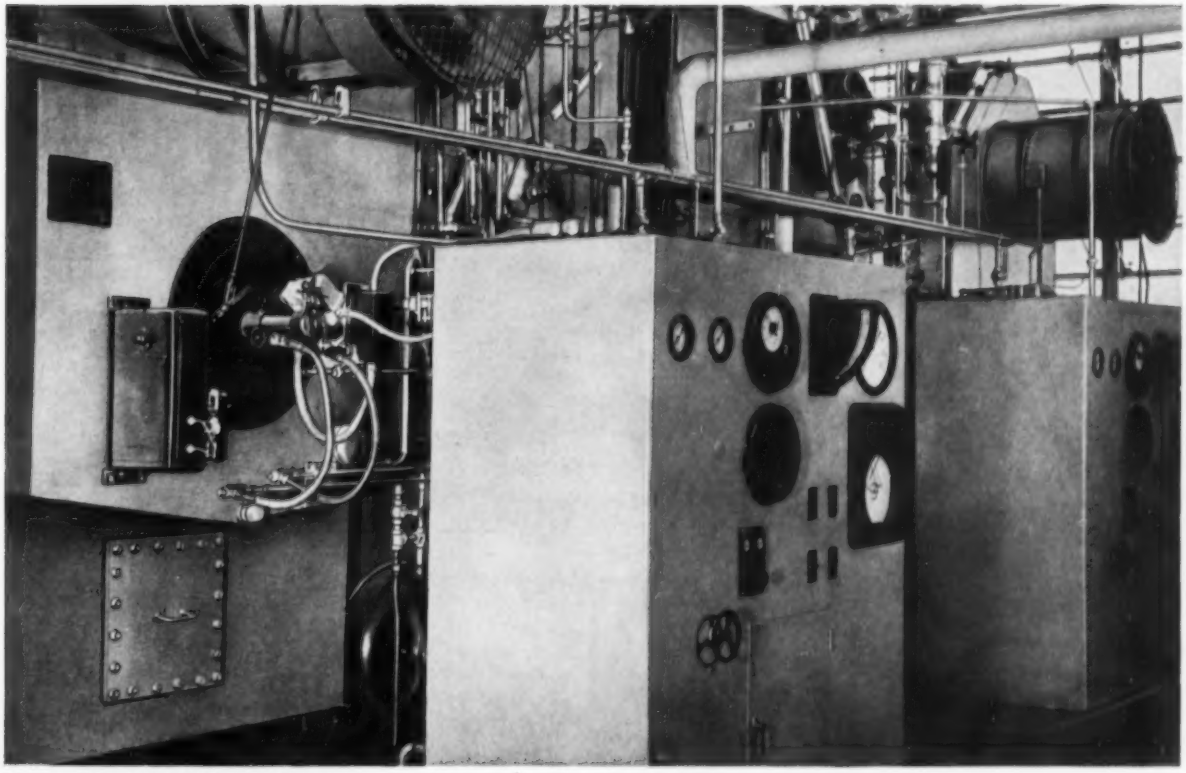
Air Diffuser . . .

. . . designed for application with germicidal lamps—Multi-Vent Div., Pyle-National Co., 1334 N. Kostner Ave., Chicago. Low velocity unit is said to allow more time for lamp rays to have effect on airborne bacteria. Incoming air passes rays at 300 fpm. System recommended by company for laboratory applications requiring bacteria free air.

keeping steam cheap . . .

Rx for HOSPITALS

with the B&W Type FM Boiler



These two Type FM, B&W Integral-Furnace Boilers supply steam for all heating, cooking, and laundry requirements at a large midwestern hospital.

Among the many enthusiastic users of the shop-assembled B&W Integral-Furnace Boiler, Type FM, hospitals have found it uniquely suitable to meet their varied steam requirements. Typical of the FM Boilers now serving hospitals in various parts of the country is this dual-unit installation, which is supplying low-cost steam for all heating, laundry, and cooking requirements at a midwestern institution.

Easy to install, this compact B&W steam generator is delivered complete with firing equipment and controls . . . is ready to skid or lift into position, hook-up, and place in operation. Push-button starting and stopping and automatic handling of load variations simplify operation . . . make the Type FM Boiler ideal for small to medium-sized installations where operators have additional duties. Even for some larger installations it has been found practical and more economical to have a multiple-unit, Type FM installation rather than one or more large boilers requiring complete field erection and close operating supervision.

Available in standard sizes for loads ranging between 2900 and 40,000 lb of steam per hr at pressures to 235 psi, this efficient B&W unit is already enjoying wide popularity with users in a broad range of industrial, commercial, institutional, and other classifications . . . is in service or on order for a total steam capacity over 12,000,000 lb per hr.

COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

For a detailed illustrated description of how you can benefit from the cost-saving features of the B&W Type FM Boiler, write for Bulletin G-76A. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.

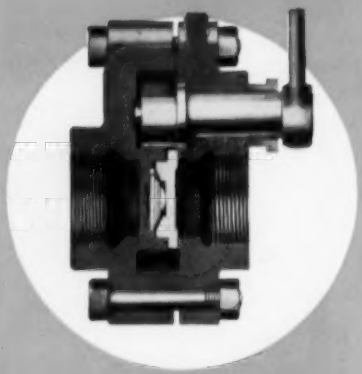
BABCOCK & WILCOX

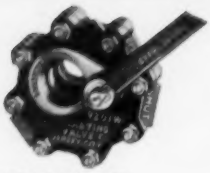
BOILER DIVISION

G-611

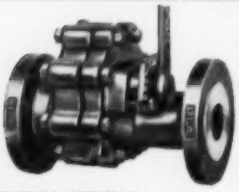
Everlasting Valves

are superior for many services





BOILER BLOW-OFF
Quick acting, also handwheel operated "Y" and angle types. For pressures up to 600 psi.



GENERAL SERVICE
Where drop-tight seal and full flow is essential.

CYLINDER OPERATED
Can be remotely controlled, electrically or manually.

STEAM JACKETED
Assures free flow of viscous materials.

WEIGHT-OPERATED
For automatic drains or emergency shut off.

When you want

- quick action
- drop-tight seal
- minimum pressure drop
- straight-through full flow
- self-grinding rotating disc
- valves that cannot wedge or jam

then you want an Everlasting Valve

No other valve has all the Everlasting features . . . proven by half a century of service to assure dependable, leak-tight service.

LET US HELP YOU WITH YOUR VALVE PROBLEMS

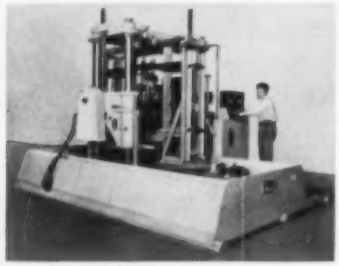
EVERLASTING Valves

EVERLASTING VALVE CO.
61 FISK STREET, JERSEY CITY 5, N. J.

EV352

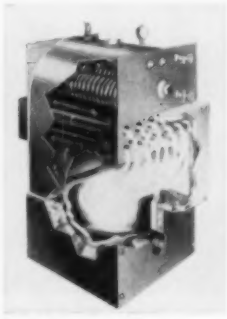
EQUIPMENT DEVELOPMENTS

Continued



Drilling Machine . . .

. . . designed to drill precision holes in condenser tube sheets—Walter P. Hill, Inc., 22183 Telegraph Rd., Detroit 19. Is said to combine speed with accuracy. For drilling on ferrous, nonferrous tube sheets to 6 ft diameter, 10 in. thickness. Thinner sheets, baffles can be drilled in stacks to 10 in. thick, says company. Drill feeds to 18 in. per min are said to have been achieved.



Water Heaters . . .

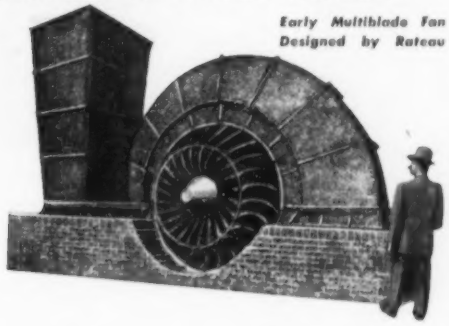
. . . with tankless, twin coil design for supplying large quantities of hot water quickly—Portmar Boiler Co., Inc., 193 Seventh St., Brooklyn 15. For apartment buildings, hotels, motels, restaurants, schools, laundries, etc. Supplied with oil or gas burner. In 14 sizes to deliver 300 to 6000 gph at 100 deg temperature rise. Supplies water at 140 F for general use, 180 F for rinse, etc.

Weld Instrument . . .

. . . for measuring iron content in stainless steel welds—Ferro Corp., 4150 E. 56th St., Cleveland 5. "Elcometer" designed to indicate ferrite content of weld to assure proper amount. Pocket sized instrument op-

Bayley FAN-A-GRAFICS
For Equipment Engineers

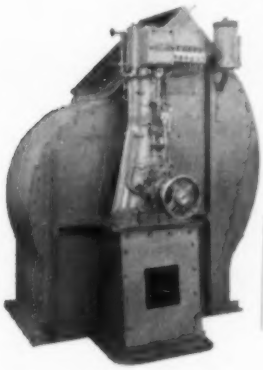
EVOLUTION OF CENTRIFUGAL FAN DESIGN



Early Multiblade Fan Designed by Rateau

THE French engineer, Camille Rateau (1863-1930) designed his forerunner of multiblade centrifugal fans on the basis of theories borrowed from experience with turbines and other centrifugal devices. Intricate castings and forgings, weak and brittle materials, slow and cumbersome prime movers, massive masonry and wood structures, were the rule.

Today's centrifugal fan evolved from theory based on specialization in fan design and usage. Modern fabricating and welding techniques, materials and components, high-speed prime movers, streamlined concrete and steel structures are now available. These refined tools can provide centrifugal fan designs adapted to modern needs, when combined with skill that is born of experience.



Early Model, BAYLEY Forward Curve Steam Driven Fan

No. 1 of a Series of "Fan-a-Grafics." Ask for FREE Pocket Cutter to trim out coming sheets for your files.

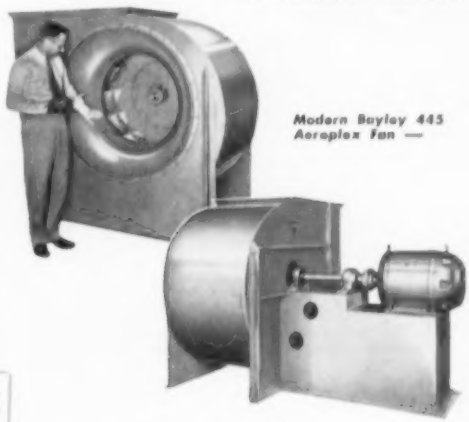
A Century Of Manufacturing . . .

BAYLEY, founded one hundred years ago, a pioneer in iron fabrication, machine building, and foundry work, became familiar with basic principles and practical application of heating and ventilating equipment as early as 1885.

This broad knowledge and background has been essential to the development and application of all types of centrifugal fans — for industrial exhaust, materials handling, high velocity air-conditioning. Bayley engineers have used basic research to convert this experience into modern designs involving various wheel styles, proportions, sizes, and arrangements.

What Your Modern-Day Fan Provides . . .

The 1956 Bayley Fan embodies the most effective used of materials and methods, achieving maximum strength-weight ratio. Structural problems are simplified. Clean design minimizes breakdown hazards. Designs are flexible — readily adapted to specific applications. Result — SYSTEM-MATCHED designs providing maximum efficiency and economy throughout the completed installation.



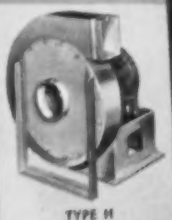
Modern Bayley 445 Aeroplex Fan — — Showing Flexible Coupling and Motor

PLEXIFORM *Forward Curve*

AEROPLEX *Backward Curve*

VENTILATING SET

TYPE EX *Industrial Fan*



TYPE H *Pressure Blower*

Engineered
AIR HANDLING EQUIPMENT

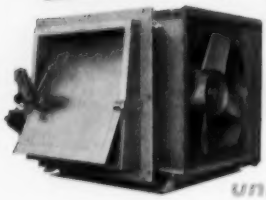
BAYLEY BLOWER COMPANY

6600 West Burnham Street
Milwaukee, Wisconsin

NO UNSIGHTLY CHIMNEY ALLOWED (OR NEEDED) IN MODERN MOTEL DESIGN

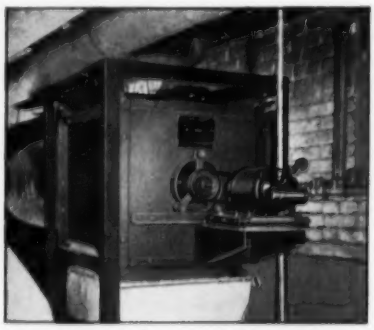
Wing DRAFT INDUCERS

. . . supply positive, adequate, uniform, motorized draft at all times



The ever-increasing number of these deluxe roadside hostelries, complete with all modern conveniences, many with swimming pools, nurseries, restaurants, etc., indicates the success of this growing business in meeting a public demand.

In planning new establishments or enlarging the facilities the low streamlined, attractive design characteristic of the motel makes a tall unsightly chimney out of the question. And unnecessary, too, for WING motorized Draft Inducers provide positive, uniform, adequate draft for boilers and furnaces, independent of weather conditions. Easily installed, and in addition to their other advantages, pay for themselves in higher fuel-burning efficiencies. Most always they cost less than a tall stack.



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L. J. Wing Mfg. Co. 140 Vreeland Mills Road, Linden, N. J.

Factories: Linden, N.J. and Montreal, Can.

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Please send me Bulletin I-56—Draft Inducers
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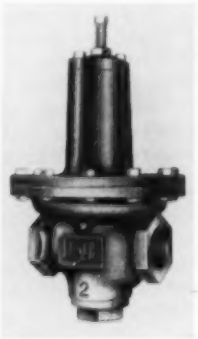
EQUIPMENT DEVELOPMENTS

Continued

erates on principle that increase of magnetic flux intensity between two soft iron test probes of "U" shaped magnetic circuit reduces forces on spring loaded magnetic needle in parallel magnetic branch.



Reducing Valve . . .

. . . for water pressure reducing—Leslie Co., 105 Delafield Ave., Lyndhurst, N. J. Cited features: large bowl construction, long travel diaphragm to give full flow; balance for smooth throttling action; renewable trim with interchangeable fit. In ½, ¾, 1, 1¼, 1½, 2 in. bodies. Inlet pressure range is 10 to 250 psi, 180 F with reduced pressure ranges 5 to 30 psi or 25 to 80 psi. Minimum pressure drop is 5 psi, says company.

Air Conditioners . . .

. . . designed for installation in casement windows—Airtemp Div., Chrysler Corp., 1600 Webster St., Dayton 1. In "Deluxe" and "Special" models, both in ½, ¾ hp capacities. Fit into standard casement windows. Are also adaptable to windows with nonstandard dimensions. Manufacturer cites ease of installation as feature.

Vibration

REDUCED TO THE VANISHING POINT

REDUCED TO THE VANISHING POINT

in the electronically made

U.S. VIBRA-LESS V-BELT

The new U. S. VIBRA-LESS Belt brings new efficiency to washing machines, driers, belt-driven fans, air conditioners, machine tools, grinders and a host of other applications. Electronic tension and a new molding method are the reasons why.

Electronic Tension process builds the pulling cords into the belt by error-proof electronics, instead of by mechanical means. All cords are placed and spaced with scientific accuracy—to guarantee that each pulls its full share of the load, thereby prolonging belt life. Each cord is of equal tightness, for exact uniformity and greater reliability.

And along with Electronic Tension, "U. S." has introduced a new method of molding which produces a smooth surface with no high spots or imperfections. Consider what this means to high-precision machinery.

The new U. S. VIBRA-LESS Belt is so superbly accurate and uniform in construction that it runs with a smoothness and a silence never before encountered on a V-Belt drive. It reduces wear and tear on pulleys and bearings, prolonging belt life and drive life, and the equipment on which it is used. VIBRATION IS IMPERCEPTIBLE, thanks to the unfailing accuracy of these new developments. More information is obtainable through any of the 27 "U.S." District Sales Offices. Or write us at Rockefeller Center, New York 20, N. Y.

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PIPELINE "MUFFLER"

GARLOCK RUBBER EXPANSION JOINTS

prevent transmission of sound and absorb vibration in water, air, or exhaust steam lines . . . save wear and tear on pipe flanges. Garlock Expansion Joints are made for all pipe sizes from ¾" to 72" and for all service conditions. They are another important part of the Garlock 2000 . . . two thousand different styles of packings, gaskets, and seals for every need. The *only* complete line available. That's why you get unbiased recommendations from your Garlock representative. Call him, or write for Rubber Expansion Joint Folder AD-137.

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Palmyra, New York

For Prompt Service, contact one of the 30 sales offices and warehouses throughout the U.S. and Canada.

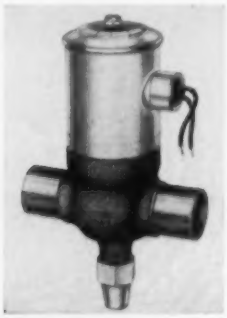
GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Rubber Expansion Joints

EQUIPMENT DEVELOPMENTS

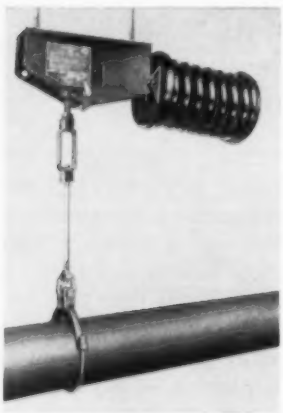
Continued

Installed, conditioner entirely enclosed within room, so when not in use, window can be closed, locked. Company's 1956 line also includes conventional, "All-In-Wall" and "All-In-Window" models in capacities ¾ to 1 ½ hp.



Solenoid Valves . . .

. . . with modified design for greater flexibility, increased capacity—Sporlan Valve Co., 7525 Sussex Ave., St. Louis. New line features company's "Blue Seal Coil." Some models changed to provide universal application for "F-12" or "F-22," says company. All pilot piston operated types have synthetic seating, said to facilitate tighter closing.



Support Hangers . . .

. . . with 31 to 32,267 lb load capacities—Grinnell Co., Inc., 260 W. Exchange St., Providence 1, R. I. Are said to permit expansion, contraction of piping systems without developing dangerous stresses. Nine frame structures available.

UTILITY UNIT HEATERS MAKE A LOT OF SALES-CENTS

UNIT HEATER

Any way you look at the new Utility unit heaters, you're bound to agree: they're handsome additions to a most complete line. But handsome is as handsome does, and these feature-loaded unit heaters are guaranteed to deliver the bonus performance you expect of Utility without any "bonus" being added to the purchase price.

To durable good looks add these features of the future, extra reasons to specify Utility: Bonderized undercoat and handsome baked enamel finish; Armor-Glas® protected heat exchanger to prevent corrosion; completely pre-wired at factory with Summer-Winter switch; automatic fan control that delays fan operation until unit is heated; 24-volt control system for easy installation.

Only Utility gives you the years-ahead design, superior engineering and down-to-earth price tags that sell the job . . . plus the guaranteed dependability that keeps it sold.

UTILITY APPLIANCE CORP.
Manufacturers of Utility Furnaces, Air Coolers, Air Conditioners, Water Heaters and Gaffers & Sattler and Occidental Gas Ranges.

UTILITY
TRADE MARK

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NEW INGERSOLL-RAND CENTRIFUGAL MOTORPUMP

NOW in the 1¼ inch discharge size

Operates efficiently in any position!

THIS NEW 1¼ KRVSA MOTORPUMP now available from 1 through 3 horsepower . . . size for size more compact and lightweight than any other type of centrifugal pump in the field!

- Capacities to 150 gallons per minute—heads to 125 feet.
- Easy installation without special foundation.
- Designed to keep maintenance at minimum.
- I-R heavy-duty features add to long service life.
- Dependably powered with NEMA motors giving added compactness.

Get our latest MOTORPUMP bulletin covering units from ¼ to 75 horsepower and find out why these rugged units are well known as the "dependable pumps you install, start . . . and forget!"

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INDUSTRIAL AIR CONDITIONING HANDBOOK

Information on the purpose, cost, design, operation and maintenance of both process and comfort air conditioning systems in manufacturing plants of many kinds. The combined knowledge and experiences of 33 prominent engineers, every one a designer or in direct charge of the largest factory air conditioning systems in operation. This shows other engineers how air conditioning helps speed production, improve products, increase worker efficiency and operate systems economically. 186 pages, $1.50

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A practical volume which reveals how various difficult piping problems in different industrial plants were successfully worked out by piping experts. Design, installation, operation, and maintenance. . . .steam, air, gas, oil, process, water and refrigeration piping. . . .piping in pulp and paper and steel mills, and other manufacturing plants is dealt with from different angles. 196 Pages, 8½" by 11", $1.50.

SNOW MELTING MANUAL

Complete information on correct design, installation and operation of snow melting systems is offered in this reprint of articles originally published in "Heating, Piping and Air Conditioning." Design data based on a study of—and others' actual experience with—over 100 snow melting systems of all kinds. Applications illustrated, for loading platforms and docks; sidewalks; roads; driveways; marquees; parking areas; runways; railway switches, etc. 20 pages, 50c

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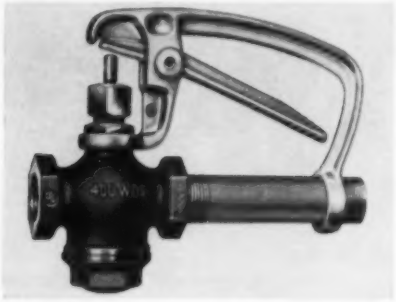
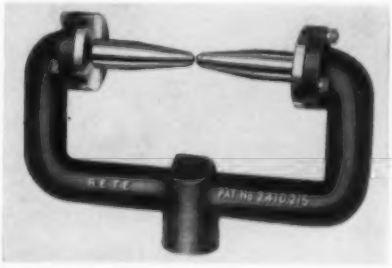
EQUIPMENT DEVELOPMENTS

Continued



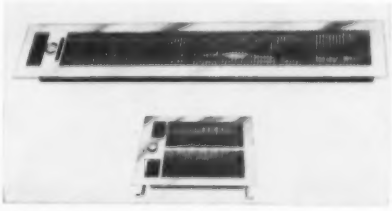
Bronze Valves . . .

. . . for LP gas service—Ohio Brass Co., Mansfield, Ohio. Lever operated No. 8009 (shown) permits back pressure to escape from line in direction away from operator as safety feature. For pressures to 400 psi gas, oil or water. In sizes ½, ¾, 1 in. No. 8001, also for 400 psi gas, oil, water, has conventional globe valve design. Features outside bonnet, slip-on disc holder for changing discs. In nine sizes ⅜ to 3 in.



Opposed Jet Nozzles . . .

. . . designed for high atomization efficiency—Bete Fog Nozzle, Inc., 309 Wells St., Greenfield, Mass. Interior of nozzle tips produces laminar flow at point of impingement with laminar sheet being generated. Sheet is said to break up into fine droplets of uniform size. In four sizes with 3 to 30 gpm flow rates. Pipe connections are ⅜, ¾, 1, 1½ in.



Wall Heaters . . .

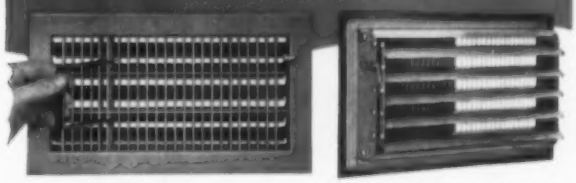
. . . designed to combine radiant, convection heating—Trade-Wind Motorfans, Inc., 7755 Paramount Blvd., Rivera, Calif. Multi-grooved grille is said to give unobstructed radiant heating, at same time accelerate convection heating. In two sizes, available with built-in thermostat or with on-off switch control. Wattage ranges 1300 to 1650 using 115 volts, a-c.

You can get

DIRECTED AIR FLOW

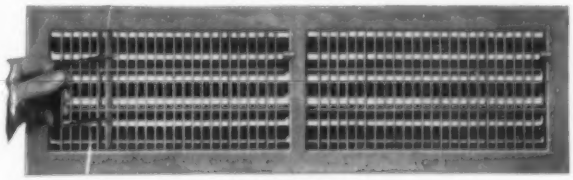
at any angle with

INDEPENDENT "Fabrikated" AIR CONDITIONING REGISTERS



321-A HMV — Rear View Showing "HMV" Valves

Every grille bar adjustable individually—before or after installation



321-A HMV Tandem

Any direction of air flow—right, left, up, down and any combination—is easily obtained with "Fabrikated" Style No. 321-A HMV air conditioning registers, for residence or commercial installations, on sidewalls or ceiling. The face bars are adjustable to right or left; valves on the back are adjustable to direct the air flow up or down; valves may also be fully closed, and are connected to open or close in unison.

The angles of deflection and the combinations to be had are practically unlimited. Adjustments for directed air flow may be made before or after installation. Grille bars are held firmly in place and will not vibrate or rattle.

"Fabrikated" registers are available in sizes from 8 x 4" to 48 x 24", including tandem style. Special sizes can be made without special die set-up charges.

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WITH LOWER PRESSURE DROP!

Boost the Efficiency of Your Installations with

JE "floating" diaphragm
SOLENOID VALVES

Here's a fast, easy way to improve fluid flow . . . install a J-E "Floating" Diaphragm Solenoid Valve. This free-floating diaphragm gives less resistance . . . allows greater fluid flow with the same pressure differential.

Another time-saving feature is J-E's improved manual stem. It simulates the magnetic action, opening the pilot port with no more than ¾ turn of the stem–eliminates mechanical strain.

All this, plus:

QUIET OPERATION . . . no mechanical linkage or impact action.

DEPENDABILITY . . . tight seating, yet no chance for jamming or clogging.

EASY MAINTENANCE . . . only two moving parts . . . cool-operating coils . . . one size coil and one plunger fit all valves.

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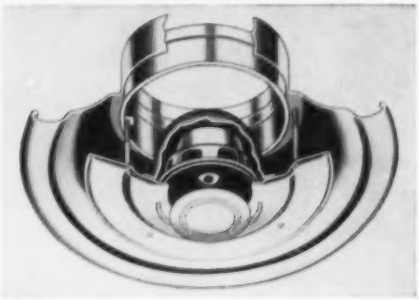
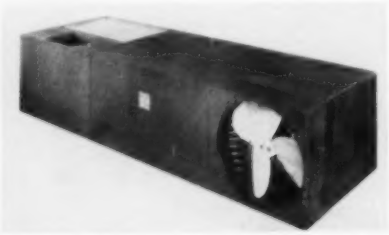
EQUIPMENT DEVELOPMENTS

Continued



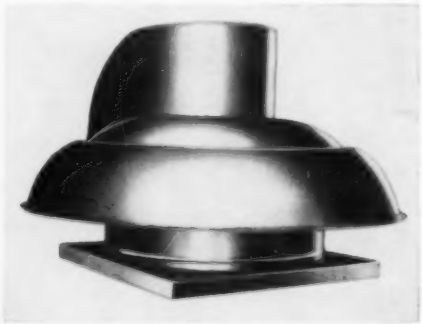
Air Diffuser . . .

. . . designed to accommodate 8 in. high fidelity loud speaker—Connor Engineering Corp., Danbury, Conn. Recommended for air terminals, plant cafeterias, manufacturing and assembly areas. Air discharge does not distort sound quality. Nor are capacity, performance of diffuser affected by diffuser housing, says company. Diffuser available in 14, 16, 18 in. neck sizes, with or without damper. Any extended range 8 in. speaker may be used.



Mobile Conditioner . . .

. . . for display vans, mobile stores, etc.—Ellis & Watts, Inc., P. O. Box 33, Cincinnati 36. Self contained units operate by electricity. Designed for cooling, humidifying, dehumidifying, filtering, heating. For installation inside or outside of van. In capacities 1 to 20 tons. Hermetically sealed refrigeration system air cooled.



Centrifugal Roof Ventilator . . .

. . . for buildings where pleasing appearance, quiet performance prime requisites—DeBothezat Fans Div., American Machine and Metals, Inc., East Moline, Ill. Is said to move large air volumes at static pressures

There's MORE rating selection available in Allis-Chalmers MOTORS

To meet your needs...

Allis-Chalmers Offers Complete Line of Rib-Type MOTORS from 1 to 100 Hp

Allis-Chalmers, a pioneer in rib-type TEFC motor design, is the only leading manufacturer offering a complete line of these motors from 1 to 100 hp. The many cost-saving features of deep-rib construction can be applied in a variety of uses . . . both indoors and out.

Here's why these motors can cut service costs:

MORE cooling surface — Rib-type design provides reserve cooling capacity in dirty locations.

MORE iron—Cast-iron frame and external parts assure rigidity and resistance to corrosion.

MORE copper — Allis-Chalmers greater use of copper increases electrical life.

MORE lubrication provisions — Large grease reservoirs surround bearings. Provision made for in-service relubrication — important where moisture or corrosive vapors contaminate grease.

As a new machinery component or as replacement, specify Allis-Chalmers. To find out more, contact your nearby Allis-Chalmers distributor, district office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

A-4943

ALLIS-CHALMERS

You've never seen a pipe vise handy as this 40A Tristand

by RIDGID

with built-in folding tray...

all one unit, no loose parts, easy to set up or fold up for carrying . . . and tray makes it rigid as a stubborn mule!

Vise overhangs front legs so threader handles swing clear . . . Extra light, strong . . . Big vise base, pipe and conduit benders, pipe rest, tool slots, ceiling brace screw . . . efficient vise with LonGrip jaws—it's got everything!

Every minute Pipe Tool
TESTED
individually before shipment
Pats. applied for
Made also with 4" chain vise No. 45A
See and try 40A Tristand, ⅛" to 2½", at your Supply House!
"Threaded Pipe—It's Tight—It's Best—Costs Less"
RIDGID
Work-Saver Pipe Tools

The Ridge Tool Company Elyria, Ohio, U.S.A.

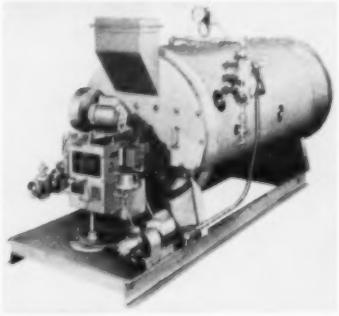
EQUIPMENT DEVELOPMENTS

Continued

at low speeds. Capacity accomplished at low fan tip speeds by backwardly curved nonoverloading centrifugal fan wheel, says company. Wheel runs in venturi shaped inlet ring, said to further reduce air turbulence noise.

Air Conditioning Registers . . .

. . . with adjustable four-way air control—Air Control Products, Inc., Coopersville, Mich. Air volume may be adjusted at register face without changing air pattern, says company. Change in desired air flow made with tool furnished with units. Spring loaded volume control damper opens to 90 deg.

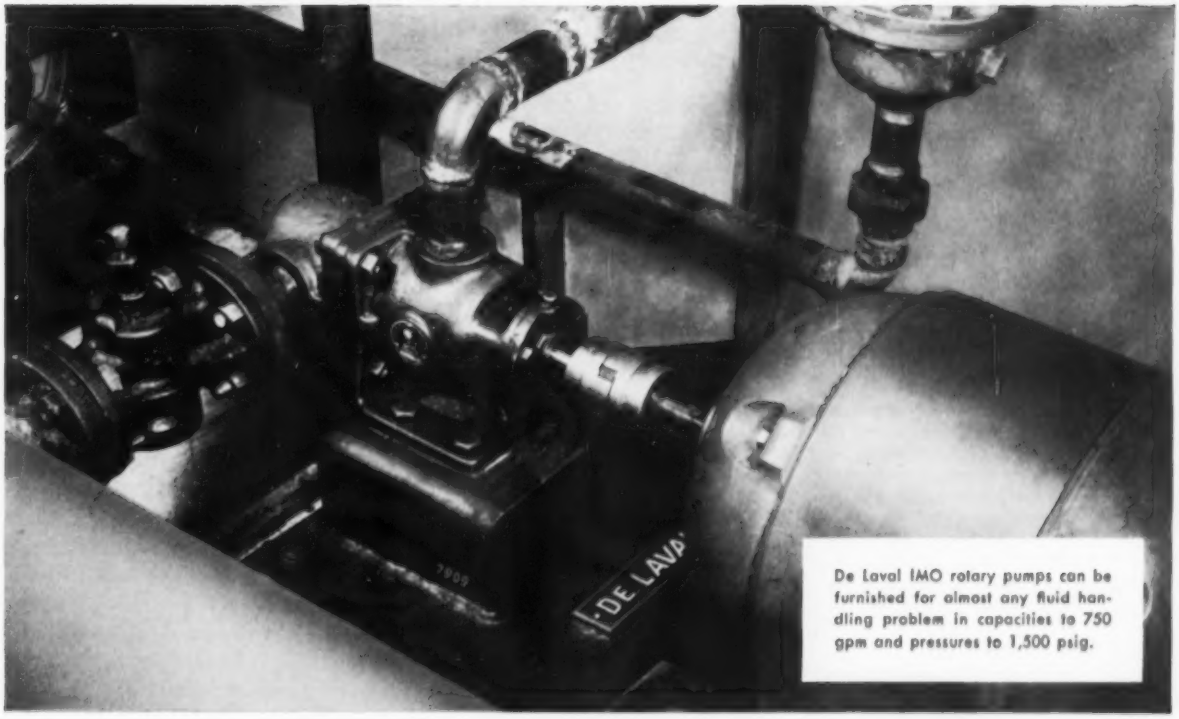


Packaged Boilers . . .

. . . in 12 to 125 hp size range—Eclipse Fuel Engineering Co., Rockford, Ill. Scotch type "Steamboilerplants" for gas, oil, combination firing. Units, as shipped, complete with necessary valves, controls. Boiler trim mounted and piping, wiring completed, says company. Large steam space combined with larger storage designed to give greater reserve capacity. Larger internal furnace is said to have 300 percent greater combustion volume.

Room Air Conditioner . . .

. . . with activated charcoal filter—Amana Refrigeration, Inc., Amana Iowa. Can be timed to turn on and off automatically at preset intervals. In ½, ¾, 1, 1½ hp sizes for installation in standard and casement windows.



De Laval IMO rotary pumps can be furnished for almost any fluid handling problem in capacities to 750 gpm and pressures to 1,500 psig.

What to Look for in a Rotary Screw Type Pump

By W. J. MONCON, *Assistant Chief Engineer*
De Laval Steam Turbine Company

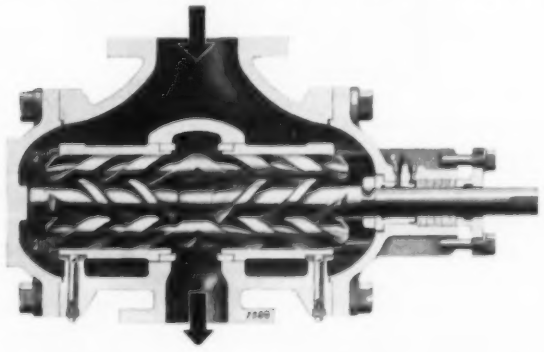
A sound knowledge of design, and how it affects performance, is the best insurance a buyer can have that he will get the pump he needs. This brief analysis of the IMO, a rotary three-screw pump manufactured by the De Laval Steam Turbine Company, will give you some of the necessary facts.

What qualities should you look for in a rotary type pump? It must, of course, meet specified capacities and pressures. But, it must also be efficient, operate quietly, stay on the job.

The axial flow of a screw type pump, and the resulting low inlet losses for any given pump speed, are important benefits that should be considered in making pump selections. The absence of timing gears and other mechanical features of construction also enable the De Laval IMO pump to operate at direct-connected motor and turbine speeds . . . to handle viscous liquids and high suction lifts.

One of the most important features of the IMO pump is the hydraulic turning of the idler or sealing rotors. The central or power rotor is the pumping element; the liquid pumped turns the sealing rotors.

A screw type pump is well suited for applications where pulsation-free flow is desirable. The axial flow of the liquid without trapping and the unique thread form which keeps closures fluid-tight contribute to quiet operation of the IMO pump.



De Laval IMO Series A322A, a positive displacement, rotary screw type pump, can handle capacities to 750 gpm and pressures to 150 psig.

Catalog LS gives useful application and specification data on the IMO pump. An article titled, *Rotary Pumps, Basic Considerations in Their Application*, contains a description of rotary pumps in general. For these publications, write on your company letterhead to De Laval Steam Turbine Company, 871 Nottingham Way, Trenton 2, New Jersey. DL-201

NEW

WEINMAN

type AC centrifugal pump for air conditioning systems

When outside atmospheres are laden with abrasive dust particles, recirculation of cooling water in air conditioning systems using cooling towers becomes a major maintenance headache. Shaft seals become worn far more quickly than normal and leakage occurs.

The Type AC pump was designed specifically by Weinman engineers to render long service under these conditions; in addition to a rotary type mechanical shaft seal, there is provided a reversible ceramic floating seat and carbon washer combination held by a stainless steel spring, insuring longer life and leakproof operation. The shaft is solid stainless steel, preventing rust or corrosion even when cooling water is chemically polluted.

CLOSE-COUPLED

MOUNTS IN ANY POSITION TO FIT REQUIREMENTS

Wherever thoroughly dependable, trouble-free circulation of hot or chilled water, pressure-boosting, or other general pumping needs are indicated, Weinman Type AC pumps will give superior service. If you have a pump problem, call your nearest WEINMAN Centrifugal Pump Specialist or write for Bulletin 725 . . . perhaps the Type AC pump is exactly what you need!

Representatives in principal cities.

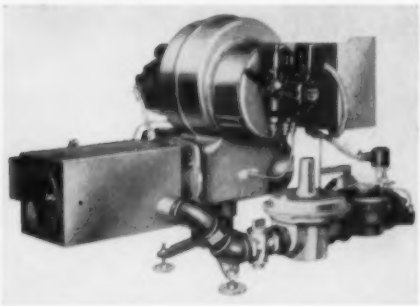
Built by Centrifugal Specialists

The WEINMAN Pump Mfg. Co.

286 SPRUCE STREET • COLUMBUS 2, OHIO

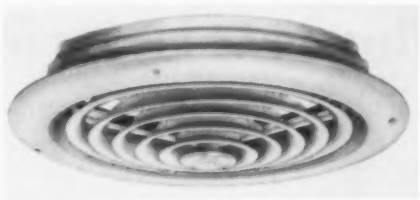
EQUIPMENT DEVELOPMENTS

Continued



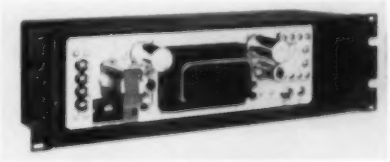
Gas, Gas-Oil Burners . . .

. . . in four commercial models—Iron Fireman Mfg. Co., 3170 W. 106th St., Cleveland 11. Gas burners available in capacities ranging 500,000 to 3 million Btu input. Combination units fire at 5 to 20 gph of oil. Gas burners fire with natural gas only. Air for combustion furnished by integral fan. No secondary air dampers required, says company. Units delivered as complete packages, supplied with necessary controls including electronic combustion control system.



Ceiling Diffuser . . .

. . . designed for adjustability in applications where varying air pattern demanded—Air Control Products, Inc., Coopersville, Mich. Performance ranges from horizontal air movement at ceiling to concentrated vertical pattern, says company. Adjustment made by turning center cap. In six sizes 8 to 22 in.



Transmitting Potentiometer . . .

. . . based on new operating principle—Industrial Controls Div., Manning, Maxwell & Moore, Inc., Stratford, Conn. Unit is said to permit measurement, control of low voltages while drawing negligible current from source. Available as thermocouple pyrometer or to measure d-c output of electrical transducers. Uses no slidewires, batteries, standard cell, "chopper" or converter, says company. Two vacuum tubes provide circuitry.

the impulse that revolutionized steam trapping

YARWAY IMPULSE STEAM TRAP

the only moving part

...a small stainless steel valve that literally floats on the condensate load. Gets equipment *hot in a hurry—and keeps it hot!*

Twenty years ago YARWAY applied a unique theory of thermodynamics to steam traps—and gave industry the amazing YARWAY Impulse Steam Trap.

Today—over a million YARWAY Impulse Steam Traps later—advantages like the following continue to convert new users, and convince old users to standardize on the YARWAY Impulse:

- QUICK HEAT-UP AND EVEN TEMPERATURES OF EQUIPMENT
- GOOD FOR ALL PRESSURES WITHOUT CHANGE OF VALVE OR SEAT
- SMALL SIZE—LIGHT WEIGHT
- ONLY ONE MOVING PART
- STAINLESS STEEL—minimum maintenance
- WON'T FREEZE UP
- A COMPLETE LINE of sizes and types for every requirement
- IMMEDIATELY AVAILABLE from 270 local Industrial Distributors

For free Trap Selector, or 24 page Bulletin, write

YARNALL-WARING COMPANY
107 Mermaid Avenue, Philadelphia 18, Pa.

SERIES 60 and 120

For all *normal* trap requirements, pressures to 400 and 600 psi.

½" No. 20-A

For *light loads* on tracer lines, steam mains, small presses, etc.

SERIES 40

For *heavy loads* requiring extra high capacity steam traps.

INTEGRAL-STRAINER HIGH PRESSURE TRAP

For *high pressures, high temperatures.* (Flanged or welding connections.)

YARWAY **IMPULSE® STEAM TRAP**

OVER 1,000,000 YARWAY IMPULSE STEAM TRAPS USED

AN OLD FAVORITE

and 2 new Power Drives

by TOLEDO

National Standard for Quality Pipe Tools

SMALL RATCHET PIPE THREADERS

Ideal for close corner work—instant change, drop-out die head—cuts easy with finest precision made tool steel dies—easily removed for regrinding—up to 2". Excellent for use with power drives.

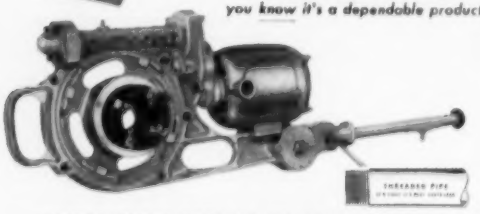
NO. 78 PORTABLE POWER DRIVE

Lightweight powerful weighs only 75 lbs.—sturdy folding legs built like a machine tool. See it at your supplier's today. Handles ¼ to 2" pipe.

NO. 68 TOLEDO PORT-A-PONY

A 26 lb. power drive—carry it anywhere. Threads, cranks, pulls, lifts—versatile and powerful. Add power to hand equipment. Write for complete information.

If it bears the famous TOLEDO label you know it's a dependable product.



TOLEDO PIPE THREADING MACHINE COMPANY
TOLEDO 4, OHIO

BUILDERS OF THE WORLD'S FINEST PIPE TOOLS

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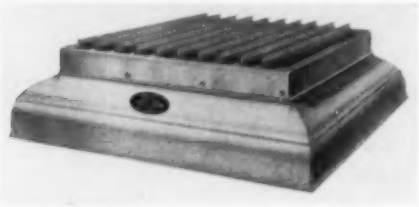
PIPE THREADERS • PIPE WRENCHES • PIPE MACHINES

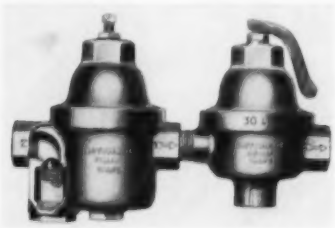
EQUIPMENT DEVELOPMENTS

Continued



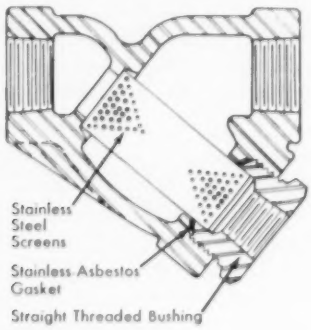
Roof Exhauster . . .

. . . of aluminum construction designed for low silhouette, high efficiency—Iron Lung Ventilator Co., 5403 Prospect Ave., Cleveland 3. In sizes 20 to 60 in. with capacities 3800 to 42,000 cfm. Cited features of "Alumalung:" all joints welded; lightweight; requires no painting; is easy to install; 21 in. overall height.



Valve Combination . . .

. . . for filling, relief on hot water heating systems—H. A. Thrush & Co., Peru, Ind. With built-in check designed to prevent loss of water from hot water heating system in cold water supply line. Being built-in, is not possible to omit this safety feature from installation, says company. Company's ½, ¾ in. pressure regulating valves also have feature.



Pipe Strainers . . .

. . . for oil, gas, air, water, steam lines—Armstrong Machine Works, Three Rivers, Mich. "Y"-type units designed for pressures to 900 lb, temperatures to 900 F. Maximum pressure at 100 F is 1800 psig. Available in ½ to 2 in. sizes. With screwed or socket weld. Units include stainless-asbestos gasket locked-in between body and base of bushing said to eliminate chance of blowout.

Step Up to the Best

Step Up to

When you step up to a counter with the bright green "Genetron" counter mat on it, you know you've stepped up to the best refrigerants money can buy. You know you're dealing with a progressive wholesaler who looked over the field and chose "Genetron" Super-Dry Refrigerants as the brand to offer you.

No wonder! In "Genetrons," you will be getting dependable refrigerants that are:

- **Super-Dry: guaranteed exceptionally low moisture content.**
- **Non-corrosive to standard equipment materials.**
- **Non-toxic, non-flammable, stable, safe.**
- **Critical and freezing points are well outside range of operating uses.**
- **Solvent action on oil helps prevent solidification or congealing of lubricant.**
- **Miscible with oil; aid in lubrication of equipment.**

Order today—from the man with the bright green "Genetron" mat on the counter!

genetron® 12—WHITE LABEL
DICHLORODIFLUOROMETHANE

genetron 141—GREEN LABEL
MONOCHLORODIFLUOROMETHANE

genetron 11—ORANGE LABEL
TRICHLOROMONOFLUOROMETHANE

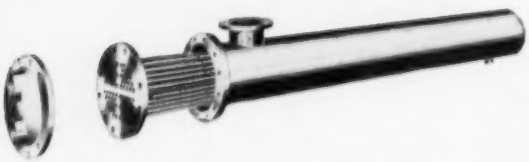
"Genetron" Super-Dry Refrigerants are Products of

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Allied Chemical

Whatever temperature you want
Get it better, faster, with a

TACO HEAT EXCHANGER!



Whatever your requirements . . . simple or complex, for heating or cooling . . . Taco can supply the right heat exchanger.

Taco know-how and quality control production have teamed up time after time to provide *the* right heat exchanger for a multitude of different jobs for a wide variety of companies. This same experience is yours for the asking.

Call or write today for complete information

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Condensate coolers, converters, chillers, circulating pumps, fuel oil heaters, oil coolers, radiation heaters, tank heating units, water heaters.

BETTER HEATING — Taco — BETTER WITH TACO

Send Technical Heat Exchanger Data Sheet to:

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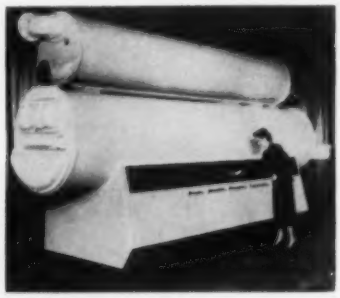
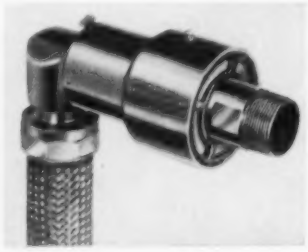
EQUIPMENT DEVELOPMENTS

Continued



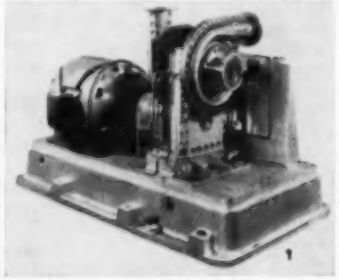
Absorption Machine . . .

. . . with "pushbutton" operation—Carrier Corp., Syracuse 1. In sizes 100 to 700 tons. For air conditioning, process cooling systems. Having no major moving parts, machine employs water as refrigerant. Activated by pressing stop-go button, as illustrated. In 11 sizes ranging 100 to 700 tons. May also be operated from time clock or thermostat.



Rotary Joint . . .

. . . for conveying liquids or gases from stationary pipe outlet to revolving cylinder, drum, etc.—Seamlex Co., Inc., 41-23 24th St., Long Island City 1, N.Y. Shown is 1½ in. pipe size, single flow type "PR 25." Unit has heavier construction, is equipped with two ball bearings designed to support, guide axially revolving shaft. Available in ⅜ to 2 in. IPS sizes in syphon and single flow types.



Air Compressor . . .

. . . for instrument air systems at low flow rates—Sawyer Bailey Corp., 1559 Niagara St., Buffalo 13. Designed to furnish clean, oil free air. Flows are said to be as low as 350 scfm at 65 psi absolute. Shown is unit with 150 hp motor for flows to 750 scfm.

These customers will drive in . . .

when you have snow melting!

"Not just a convenience but a *distinct competitive advantage!*" . . . that's what merchants are saying about snow and ice removal systems for super markets, shopping centers, service stations, department stores and other commercial establishments selling to the public.

Clean, bare driveways, parking areas and sidewalks (contrasted with snowy, slushy street approaches and *un*cleared competitors' places) become a strong *invitation* for shoppers to "turn in" . . . to do business where they are so obviously wanted. That's not just theory, but *fact*, proved statistically by progressive businesses where steel pipe snow melting systems are at work.

Yes, *steel pipe* is the first choice for these installations. The known economy of steel pipe makes investment in a snow melting system economically practical. And in service, steel pipe has a performance record proved in more than 60 years in hot water and steam heating applications. Add to this the advantages of formability and weldability for coil fabrication and you know why steel pipe is the most widely used pipe in the world . . . for snow melting, heating, plumbing, fire sprinkler systems, power, steam and air transmission.

Send for the free 32 page booklet "Steel Pipe Snow Melting and Ice Removal Systems."

Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 FIFTH AVENUE, NEW YORK 1, N.Y.

Steel Pipe is First Choice

You Can Rely on GOODALL EXPANSION JOINTS

For Ease of Installation and Long, Efficient Service

The problems of vibration, undesirable sound resulting from it, or expansion and contraction, are met with reliable efficiency and economy in GOODALL Rubber EXPANSION JOINTS . . . products of long experience and uncompromising craftsmanship.

WIDE SELECTION . . . Three Types — "Flang-Lok", Right Angle and Sleeve. Five styles — Single Arch, Multiple Arch, Tapered, Offset and Rectangular. All sizes — From ⅜" I. D. to 96" I. D. For pressure, vacuum or both.

EASIER TO INSTALL . . . on new construction or as replacements for other types. Light in weight . . . short face-to-face dimensions . . . retaining rings or flanges quickly aligned and bolted. "Flang-Lok" Joints are especially easy to install, and provide a nonmetallic seal.

RESPONSIVE TO MINIMUM PRESSURE . . . Only slightest pressure is required to create movement in the rubber joint, in any direction. Result — stress on metal pipe or other member is reduced to absolute minimum.

HIGHER WORKING PRESSURES . . . Goodall Rubber Expansion Joints operate efficiently at working pressures to 125 lbs. P. S. I., depending on size.

LONGER SERVICE LIFE . . . No embrittlement . . . continuous movement (Flexing) actually keeps the rubber joint "alive." No corrosion. No electrolysis. Highest resistance to abrasion.

* * *

IF YOU HAVE A CORROSION PROBLEM, it is quite possible that Goodall "RUBBERHIDE" Linings will prove to be the right solution. Our engineers will be glad to make recommendations.

Send for Illustrated Booklets, or Contact Our Nearest Branch

"If it's GOODALL, it MUST be Good!"

Standard of Quality—Since 1870

HOSE · BELTING · FOOTWEAR · CLOTHING AND OTHER INDUSTRIAL RUBBER PRODUCTS

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GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

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EQUIPMENT DEVELOPMENTS

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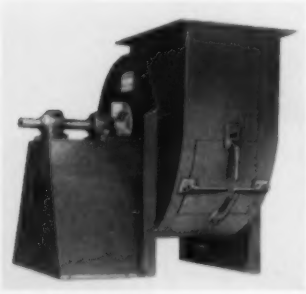
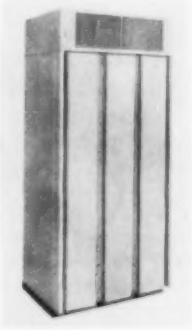


Centrifugal Fans . . .

. . . designed for high efficiencies, reduced noise levels, less power consumption—Chicago Blower Corp., 9869 Pacific Ave., Franklin Park, Ill. Is backward curved, non-overloading type featuring hollow sectioned, aerodynamic shaped airfoil blades, says company. Cited applications include commercial and industrial ventilating, air conditioning, heating applications, forced and induced draft. Wheel sizes range 13½ to 143 in. diameter. Air deliveries are 600 to 1 million cfm at 1/8 to 32 in. WG.



Air Conditioners . . .

. . . for commercial use—Curtis Mfg. Co., 1960 Kienlen Ave., St. Louis 20. Packaged units in pastel color combinations designed to blend with existing decorative patterns where installed. In capacities 3 to 20 tons.

Pipe Insulation . . .

. . . wrapper designed to cover heat insulation, protect it from weathering, moisture, chemical action—Industrial Laminates Div., Fabric Distributing Co., 54 Franklin St., New York 13.

THE FIRST **TOTALLY NEW** FILTER DEVELOPMENT . . . IN 25 YEARS

*This is not an idle claim . . . it's a fact . . . PROVEN UNDER ACTUAL INSTALLATION AND MAINTENANCE CONDITIONS.

Make no mistake about it . . . no matter how small your filter requirements . . . or how large, here is a completely new air filter development that can absolutely cut your clean air maintenance costs in half.

NO HEAVY TENSION OIL — Evans filters do not have a messy, sticky type of adhesive that is filthy to handle and difficult to clean. It is unnecessary and is forbidden in the use of Evans filters.

CLEAN WITH TAP WATER — Evans filters can be cleaned clean in minutes with nothing ever but tap water sprayed through an ordinary garden hose nozzle. They require no expensive fireproof room. No caustic cleaning solutions or agents. This eliminates all danger in the cleaning of Evans filters.

LIGHT WEIGHT CUT LABOR COSTS — Evans filters are all aluminum. Light to handle, to carry, to pick up. In spite of airtight fitting frames, Evans filters pull quickly and easily in and out of the frames. Take much less effort, less labor to handle. No latches . . . or lugs required.

REMEMBER: Initial costs for air cleaning equipment are not the big factors or controlling factors in the cost for clean air.

IT'S OPERATING COSTS THAT YOU MUST LIVE WITH AND THAT YOU MUST CONTROL.

EVANS FILTERS GIVE YOU THAT CONTROL. MAKE IT POSSIBLE FOR YOU TO SAVE 50% ON CLEAN AIR MAINTENANCE COSTS.

- ALL ALUMINUM
- EVERY PART PRECISION MADE
- HOLD UP TO 200% MORE DUST AND LINT WITHOUT HARMFUL RESTRICTION TO AIRFLOW
- GIVES LIFETIME SERVICE

FREE CATALOG

MAIL COUPON TODAY

THE GEORGE EVANS CORPORATION · MOLINE, ILLINOIS

Gentlemen: I wish to know how to cut my clean air maintenance costs in half with a filter that gives lifetime service. Please send me new illustrated catalog.

Name .....

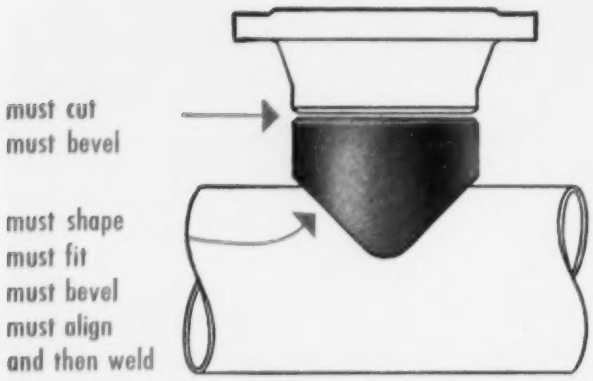
Company .....

Address .....

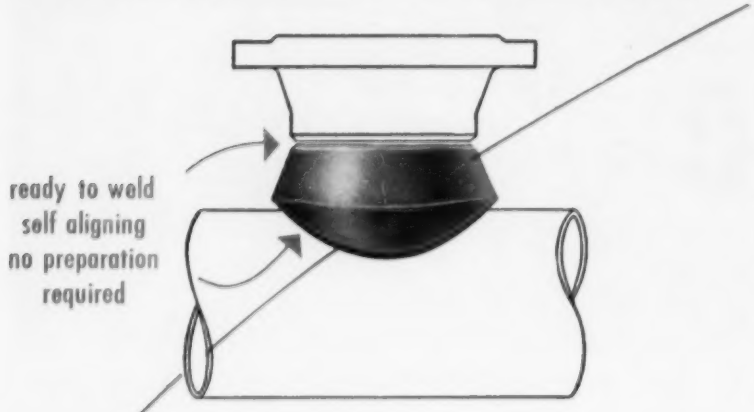
City ..... State .....

Evans

Lifelong AIR FILTERS



short nozzles DON'T PAY...



BONNEY WELDOLETS DO!

Even on low pressure piping . . . avoid non-productive preparation time . . . SPECIFY and USE WELDOLETS

No joint preparation is required for *either* weld of the Weldolet, whereas considerable preparation is required for *both* welds of the miter branch construction.

The integral reinforcement of the Weldolet Welding Fitting has established it as an ideal method of constructing branch connections on high pressure and/or high temperature piping. This feature is *bonus insurance* on low pressure piping where the Weldolet is easier and more economical to use than preparing the two ends of a short unreinforced nozzle.

Sold through leading Distributors in Principal Cities

BONNEY

WELDING FITTINGS DIVISION

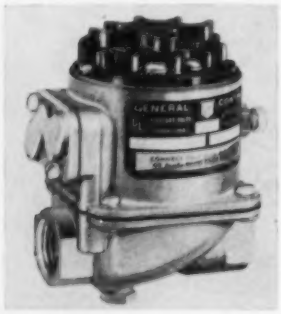
FORGE & TOOL WORKS

715 MEADOW ST., ALLENTOWN, PENNA.

EQUIPMENT DEVELOPMENTS

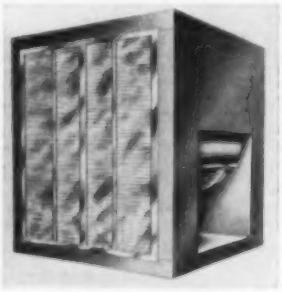
Continued

"Vycot" fabricated with heavyweight cotton cloth, heat fused with chemically resistant resins. Can be sewn or wrapped around piping surfaces. In 75 ft rolls, 54 in wide.



Shutoff Valve . . .

. . . with increased gas capacity—General Controls Co., Glendale, Calif. Cited features of improved version of company's "B-60" self powered unit are: new main line filter screen; separate terminals for wiring thermostat, limit control, pilot generator; increased relay power for positive pilot valve operation; simplified design with four screws, one gasket; built-in pilot valve filter. Recommended by company for warm air furnaces, unit heaters, gas fired boilers, other commercial and industrial applications.



Evaporative Coolers . . .

. . . with 4500 to 12,000 cfm capacities—Magic-Aire Div., United Electric Co. is manufacturer. For information: Indoor Climate Products, 316 Senisa Drive., San Antonio. Designed to have rugged construction to handle heavy duty commercial service.

INSIDE STORY:

Why a Heat Exchanger Poses for an X-ray

This technician is giving a clean bill of health to a completed weld on a P-K heat exchanger. Like the x-ray of your chest, this x-ray picture is designed to pick up flaws before they have a chance to become harmful.

Pinholes, lamination, slag inclusions, and all other symptoms of failure are ruled out by this process, which is used to scrutinize the "inside" of *every weld*. Such radiographs are indispensible in manufacturing pressure vessels that will meet every test of time and use. Each x-ray is checked by a representative of the Hartford Steam Boiler Inspection and Insurance Company —for further insurance that every P-K heat exchanger meets or exceeds the rigid standards of the 1952 ASME Code for Unfired Pressure Vessels.

But weld x-rays at P-K represent only a *precaution*. They don't speak for the fact that all P-K welders are ASME qualified for a total of more than 50 types of welding procedures—meaning that the likelihood that flaws will occur at all is minimized. Nor can you see in an x-ray photo the incredibly careful design and calculation that goes into every P-K pressure vessel, to assure that it will be *thermally* and *physically* correct in every way.

Add this all-important knowledge of thermal design to P-K's fabricating and testing procedures, and you have what makes P-K heat transfer equipment different —and better—than all the rest.

Like proof? We'd be delighted to receive your inquiry. The Patterson-Kelley Co., Inc., 720 Burson Street, East Stroudsburg, Penna. Offices in principal cities.

PATTERSON KELLEY

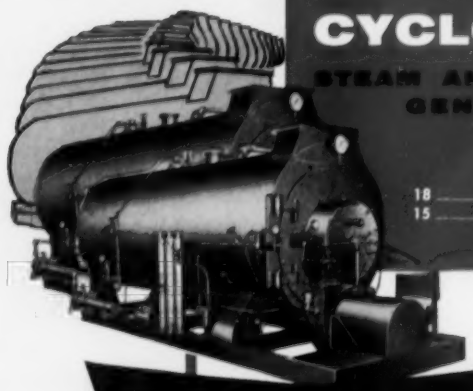
Heat Exchangers • Convertors • Storage Water Heaters • Condensers • Water Chillers • Oil Heaters • and all types of heat transfer equipment

- FOR HEATING
- PROCESSING
- AIR CONDITIONING

THOUSANDS of CYCLOTHERM

STEAM AND HOT WATER GENERATORS

18 ____ 500 hp.
15 ____ 200 psi.



PROVIDE LOWER COST STEAM

For Industry

For Dairies and Food Plants

For Dry Cleaners and Laundries

For Hotels and Office Bldgs.

For Marine Application

Satisfied users say "Cyclotherm Steam and Hot Water Generators will meet your requirements under the most exacting steam demands and rugged operating conditions . . . in a variety of climates and elevations.

Thousands of enthusiastic owners are the finest assurance *any* boiler manufacturer can offer potential customers. Cyclotherm has this assurance and one of the best re-order records in the Steam Generator industry.

Owners are enthusiastic because Cyclotherm offers them:

1. ***Exclusive Cyclotherm Cyclonic Combustion*** **. . . unequalled by any other combustion method in efficiency and economy.**
2. ***Minimum guarantee 80% efficiency*** **in only 2 passes . . . with gas, oil or combination.**
3. ***Up to 50% savings in maintenance costs.***
4. ***Minimum space requirements*** **. . . Cyclotherm is up to ⅓ smaller than other packaged units.**
5. ***Reduced installation costs*** **. . . only 5 connections necessary.**
6. ***Factory-trained Service Engineers*** **. . . available weekdays and weekends.**

WRITE TODAY for your free copy of the illustrated, informative booklet with all of the advanced space—time—and cost-saving features of Cyclotherm Steam and Hot Water Generators. Join the thousands of cost-wise, efficiency-minded buyers who order Cyclotherm whenever steam is required

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CYCLOTHERM
STEAM AND HOT WATER GENERATORS

MAIL THIS COUPON TODAY!

Cyclotherm Division, National-U. S. Radiator Corp.
2626 E. First Street, Oswego, New York

Gentlemen: Please send me a free copy of your fact-filled booklet on Cyclotherm Steam and Hot Water Generators.

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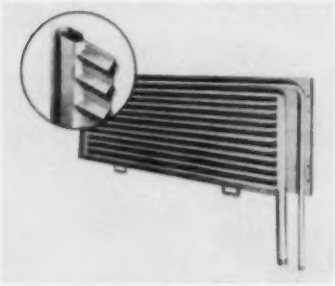
COMPANY _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

EQUIPMENT DEVELOPMENTS

Continued



Heat Transfer Units . . .

. . . with increased pressure ratings—Tranter Mfg., Inc., Lansing 4, Mich. "Platecoils" consist of embossed sheets of metal welded together to form channels for passage of heating, cooling media. Pressure ratings increased for two styles of header type, double embossed units to 150 lb. Previous maximum recommended by manufacturer was 100 lb.

Regulating Valve . . .

. . . for water regulating—Jas. P. Marsh Corp., Skokie, Ill. With 30 to 260 psi continuous adjustment range. Knurled cup at bottom designed to permit on the job hand adjustment. For mounting any position without mounting brackets. May be manually flushed, serviced without breaking connections, says company.

Impulse Steam Trap . . .

. . . for heavy condensate load applications—Yarnall-Waring Co., 107 Mermaid Ln., Philadelphia 18. Cited features: high capacity at pressures to 600 lb; stainless steel body, internal parts; no orifice change required for low pressures; steam tem-

BRUNER
WATER SOFTENERS & FILTERS

for Industrial Installations

Hundreds of Bruner Industrial Water Softener installations are proving their superiority in military bases, industrial plants, hotels, hospitals, schools and colleges in all parts of the United States, Canada, Alaska and South America.

Examples of Bruner industrial installations:

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University of Wisconsin — Madison, Wis.
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Jung Hotel — New Orleans, La.
Gulf Bay Hotel — Sarasota, Fla.
Athens State Hospital — Athens, O.

INDUSTRIAL
Chevrolet Division GM — Flint, Mich.
Hallo Bros. Dept. Store — Canton, O.
Havana Laundry — Havana, Cuba
General Electric Co. — Bloomington, Ind.

MILITARY
Wright Patterson Air Force Base — Dayton, O.
Big Spring Air Force Base — Big Spring, Tex.

There are Bruner Sales and Engineering offices in principal cities. Your inquiry will receive immediate attention.

Manual and Fully Automatic softeners in capacities up to 1,500,000 grains are carried in stock. Larger capacities and special equipment to treat unusual water conditions engineered to meet your requirements.

BRUNER WATER SOFTENERS & FILTERS

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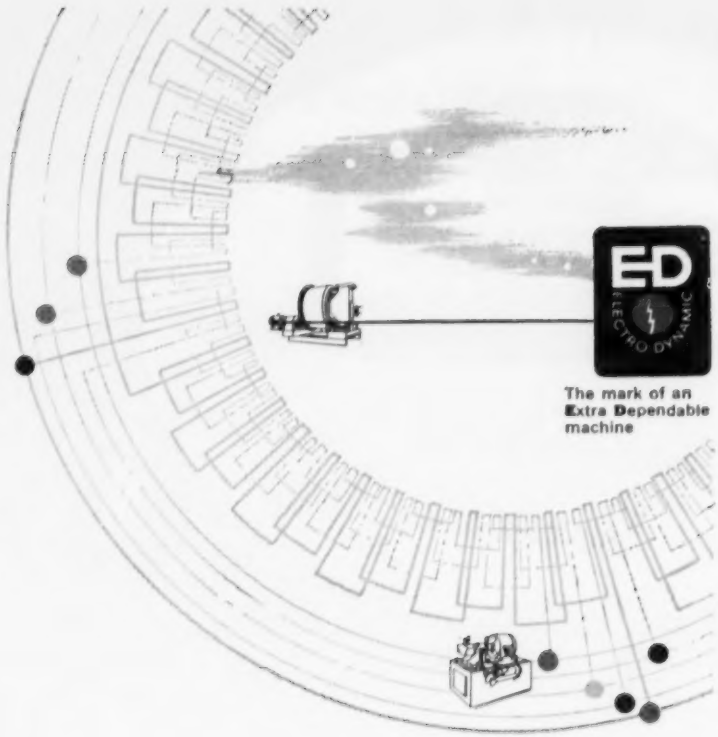
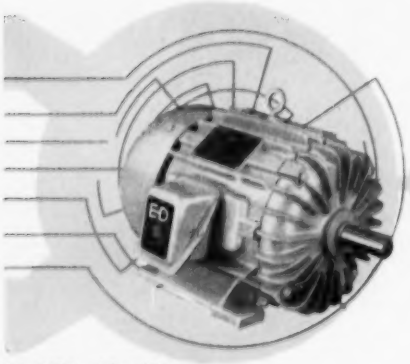


The mark of an Extra Dependable machine

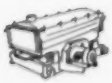
a better kind of power

FOR INDUSTRIAL MACHINES



1 to 250 hp. AC and DC. N.E.M.A. standards.

Extra starting and anti-stalling capacity: Extra cool, extra quiet operation: Achieved without sacrifice of full-load efficiency. Backed by unparalleled experience, E.D. motors are *extra dependable*—75 years in the making—yours today *at no extra cost!*



ELECTRO Extra DYNAMIC Dependable motors

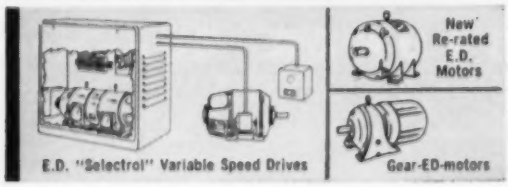
GD

PRODUCT OF GENERAL DYNAMICS

NEW...

Write for Brochure 100 and literature on new E.D. motors and drives.

Electro Dynamic division of General Dynamics Corporation Bayonne, New Jersey



EQUIPMENT DEVELOPMENTS

Continued

perature condensate discharge characteristics. Recommended by company for applications where dirt, scale are problems. In ½, ¾ in. sizes.

Control Valves . . .

. . . with new body design—Hammel-Dahl Co., 175 Post Rd., Warwick Industrial Park, Providence 5, R. I. "S-3000" series in ½ to 8 in. sizes. Body design provides large bowl capacity designed to insure high coefficient of flow without involving excess body weight. Superstructure is new concept in design of diaphragm motor actuators. Shown is valve assembled for air-to-open action. By inverting same topworks, valve is converted to air-to-close action.

1/20 to 1/3 Hp Motors . . .

. . . with NEMA 48 frame—Century Electric Co., 1806 Pine St., St. Louis 1. Cited features: high pressure cast aluminum end brackets, designed for dimensional accuracy; cluster type aluminum fan; stator iron allows space for blast of cooling air to pass between frame and core; dripproof. Totally enclosed, unit heater, permanent split capacitor types, others available in both rigid, cushion base.

The benefits of air conditioning should be FELT... not HEARD!

SEALMASTER'S

Rubber Mounted-Zone Hardened

BALL BEARING UNITS

assure long, quiet service

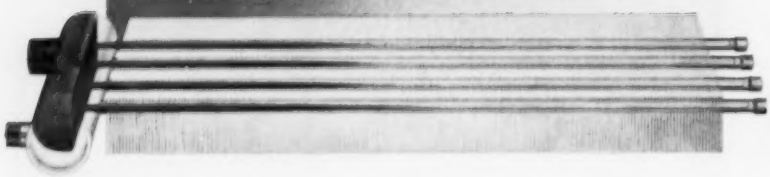
Write for Bulletin 1253. It's a must for your files.

Silent operation and smooth, continuous performance is the desire of any air conditioning manufacturer in the products he designs and builds. SEALMASTER Zone-Hardened, Rubber Mounted Ball Bearing Units reduce noise, vibration and wear and assure continuous, quiet, trouble-free operation. A Zone Hardened SEALMASTER Ball Bearing Unit is mounted in a synthetic oil-resistant rubber ring which fits snugly into a pressed steel housing—pillow block or flange type. (Cartridge units available for insertion in special and built-in housings.) The result is a compact bearing unit which, when built into your product, affords you a quality feature your customers will appreciate. It will pay for itself in product performance and repeat sales.

SEALMASTER BEARINGS A DIVISION OF STEPHENS-ADAMSON MFG. CO. • 47 RIDGEWAY AVE., AURORA, ILLINOIS

why accept this result?

Air near the steam supply header is heated while air near the return end is unheated
Temperature stratification mars system results
Condensate may be exposed to freezing



In conventional steam distributing tube surface the steam is apportioned equally among all the tubes and, under low modulation, the steam travels only partially across the surface . . . but in

Nesbitt **HEATING SURFACE**
WITH THE NEW TROMBONE DISTRIBUTING TUBES

The steam is apportioned to alternate tubes — a given quantity of steam travels twice as far in "trombone" tubes. Even the smallest quantities are distributed over the entire surface area.

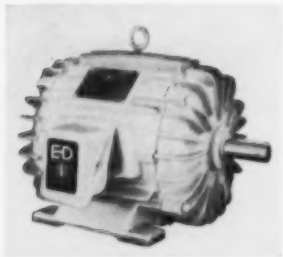
Each trombone steam-distributing tube serves two adjacent condensing tubes from a single supply-header connection. Steam must travel across the first leg of the trombone tube (the full length of the surface) before reversing, under increased demand, to serve the second leg.
This entirely new principle of steam distribution eliminates stratification and the danger of freezing over the entire capacity range — 100% to shut-off. Therefore, Nesbitt Series T Surface is unmatched for heating and ventilating applications with modulating valve control and for preheating outdoor air.

Made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa. — Send for Publication 305.

when you can have this!

Uniform final air-discharge temperatures over the full length of the surface
Ideal system results under modulated control
Positive inherent protection against freezing

EQUIPMENT DEVELOPMENTS
Continued



Motors . . .

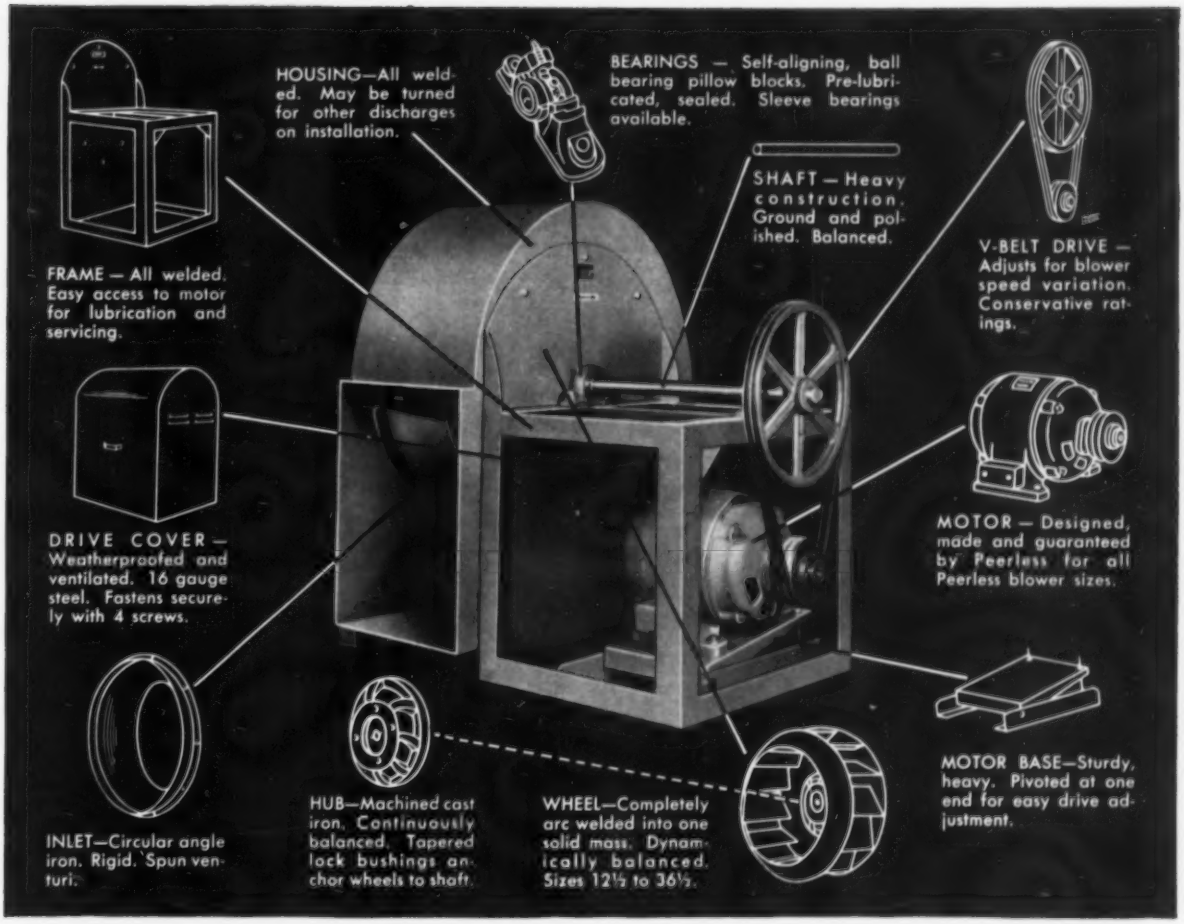
. . . in totally enclosed nonventilated, totally enclosed fan cooled types rerated to conform to recently adopted NEMA dimensional standards—Electro Dynamic Div., General Dynamics Corp., Bayonne, N. J. Designed for larger horsepower output, utilizing less space. For operation where noncombustible dust, moisture prevalent. In production are 182, 184, 213, 215 frames.

Valve . . .

. . . for combination regulating, relief service—A. W. Cash Co., P. O. Box 551, Decatur, Ill. Designed to increase efficiency of hot water space heating systems. Is installed in hot water boiler supply line. Is said to automatically control pressure to insure proper circulation through system. Feature of valve is built-in bypass which allows rapid filling of hot water system, and is accessory for pressure testing, says company.

¾ Hp Conditioner . . .

. . . designed for full power at low amperage—Fedders-Quigan Corp., 57 Tonawanda St., Buffalo 7. New 7½ ampere unit requires no special wiring to install, plugs into available 110 volt outlet, says company. Has


HOUSING—All welded. May be turned for other discharges on installation.
BEARINGS — Self-aligning, ball bearing pillow blocks. Pre-lubricated, sealed. Sleeve bearings available.
SHAFT — Heavy construction. Ground and polished. Balanced.
V-BELT DRIVE — Adjusts for blower speed variation. Conservative ratings.
FRAME — All welded. Easy access to motor for lubrication and servicing.
DRIVE COVER — Weatherproofed and ventilated. 16 gauge steel. Fastens securely with 4 screws.
MOTOR — Designed, made and guaranteed by Peerless for all Peerless blower sizes.
INLET—Circular angle iron. Rigid. Spun venturi.
HUB—Machined cast iron. Continuously balanced. Tapered lock bushings anchor wheels to shaft.
WHEEL—Completely arc welded into one solid mass. Dynamically balanced. Sizes 12½ to 36½.
MOTOR BASE—Sturdy, heavy. Pivoted at one end for easy drive adjustment.

Specially Engineered, Compatible Blower Components . . . The Reason For Outstanding Peerless Performance and Quality!

• This is the Peerless Backward Curve Blower, one of the workhorses of the dependable Peerless line. Like all Peerless units, it's designed, engineered and manufactured completely at Peerless . . . motor and all. It is this complete control from components to finished unit which enables us to unconditionally guarantee every fan and blower we make. Each component works in perfect harmony with the other to give quiet, trouble-free performance.

Peerless Backward Curve Blowers can be specified with confidence. They are thoroughly tested according to test codes. They meet PFMA, NAFM and NEMA standards. Scores of them are operating in schools, hospitals, other buildings and government installations all over the nation. We are used to producing to customer or government specifications.

Write, Wire or Phone Us Today!
Ask for Bulletins SDA-160 or SDA-200

FAN AND BLOWER DIVISION
THE Peerless-Electric® COMPANY
FANS · BLOWERS · ELECTRIC MOTORS · ELECTRONIC EQUIPMENT
1405 W. Market St. WARREN, OHIO

THE PEERLESS ELECTRIC CO.
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☐ Send me Bulletin SDA-160.
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COMPANY.....
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"Janitrol heaters are the most satisfactory for us. Maintenance is no problem at all"

O. W. WHEELER, Maintenance Supervisor, Garland-Temco Plant.

GARLAND, TEXAS BRANCH PLANT

Mr. Wheeler checks in shipment of Janitrol gas-fired units, installed as part of Temco-Garland's 1953 expansion program.

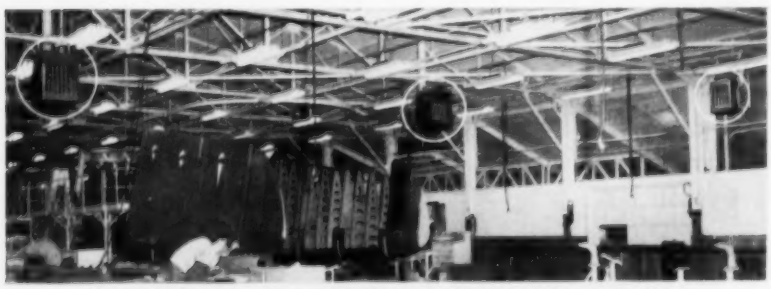
Starting in 1946 with 100 Janitrol installations, Temco Aircraft Corporation added 43 more in 1951-52 . . . 6 in 1953 to keep pace with the Garland Branch plant expansion program. Their repeat installations over an eight year period clearly indicate complete satisfaction with Janitrol quality, dependability and low operating costs.

Whether your heating needs can be met with one unit heater or 100, it's important to you that an experienced, local Janitrol contractor size and install the right equipment.

This way, you get triple assurance of efficient and economical heating. You get equipment with unequalled performance record* . . . equipment that's properly installed . . . and backed by a responsible engineering and service organization.

Local Janitrol gas heating engineer-installers are listed under "Unit Heaters", yellow pages, your phone book.

* With over a million steel heat exchanger tubes installed since 1940, less than ¼ of 1 % have been replaced for any cause.



149 JANITROL INSTALLATIONS SINCE 1946 PROVIDE EXCELLENT WORKING CONDITIONS AT LOW OPERATING COST

Janitrol
GAS-FIRED UNIT HEATERS

Write today for information on unit heaters for new or remodeled buildings of all types. Ask for "Businessmen's Blue Book of Better Heating".

Janitrol Heating
& Air Conditioning Division
Surface Combustion Corporation
Columbus 16, Ohio
In Canada: Alvar Simpson Ltd.
Toronto 13

ALSO MAKERS OF *Surface* INDUSTRIAL FURNACES AND *Kathabar* HUMIDITY CONDITIONING

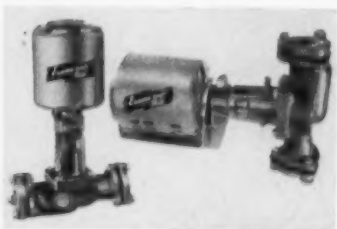
EQUIPMENT DEVELOPMENTS

Continued

"Weather Wheel" louver arrangement engineered to direct flow of chilled air in desired direction.

Adjustable Wrench . . .

. . . designed with larger opening—Diamond Calk Horseshoe Co., Duluth, Minn. Engineered so that refrigeration servicemen can use 8 in. adjustable wrench on ½ in. brass flare nuts. Heretofore, this required larger wrench, says company.



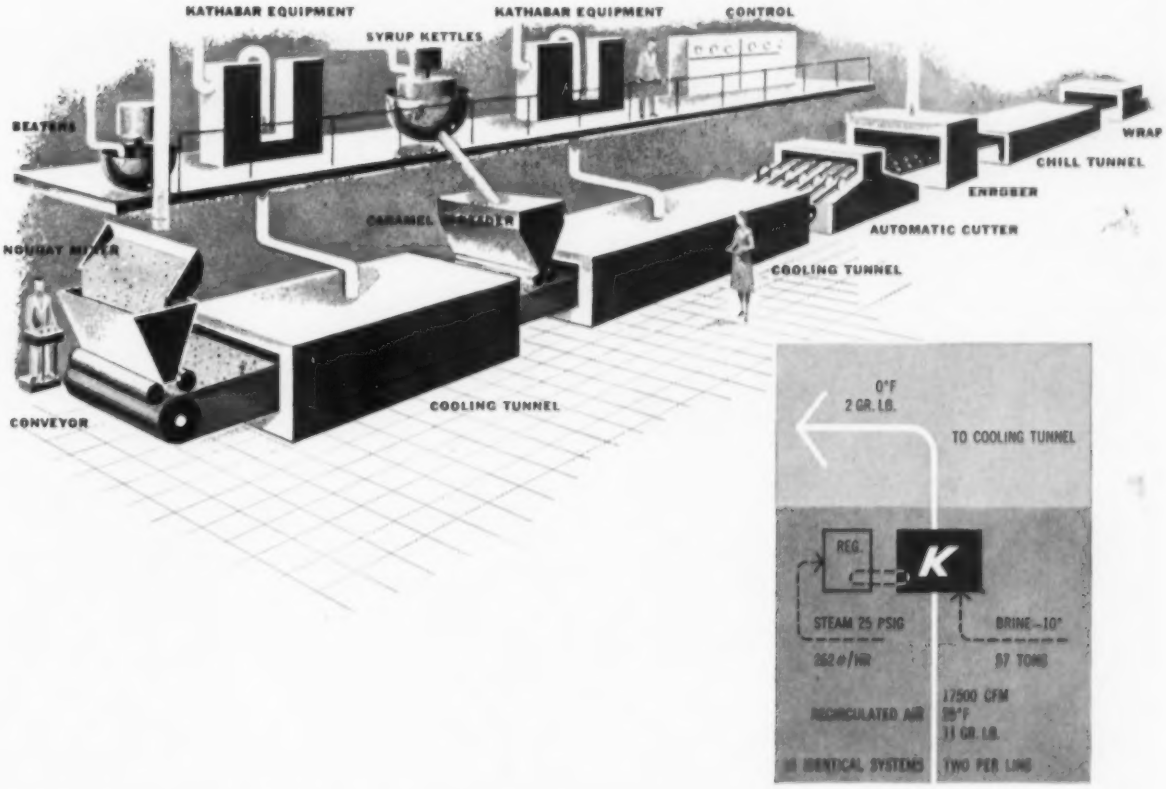
Hot Water Circulator . . .

. . . for dual use—Econo Products Co., East Haddam, Conn. Design changes incorporate motor with built-in thrust bearing to permit pump to be used as horizontal or vertical circulator. To install vertically, installer need only attach supplied vertical oil cups, says company.

Water Chiller . . .

. . . for small commercial, industrial applications—Acme Industries, Inc., Jackson, Mich. With capacities 1 ¾ to 5 hp. Available with either water

Dry air cuts bar-cooling time 98.7%



Kathabar humidity conditioning cut bar-cooling time from 16 hours to 12 minutes for one of the world's largest candy manufacturers. The company now has an economical continuous process in place of a once laborious and costly batch operation.

The chemical absorbent in the Kathabar unit removes the air moisture that would cause frost, condensation, and the troubles they create. Air temperature is regulated by the unit's coolant. Dependability of the system is proved by its continuous operation, delivering air at 0°F for 7 years.

Other candy makers have applied the Kathabar system with equal success to drying, polishing, coating, bottoming, and packaging processes. You'll find that dry air, delivered to your order by Kathabar humidity conditioning, is a profitable investment.

write for complete confectionery story today

Kathabar®
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

"The Pritchard LoLine is 7 ways better than what?"

"Seven ways better than competition."

"*Which* competition?"

"*Any* competition!"

"That expression has always bothered me in advertising. I just had to call you on it."

"Bothers me, too."

"Well, what are the seven ways?"

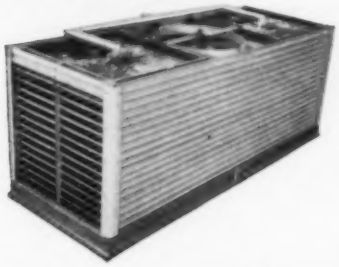
"First, it's the lowest silhouette tower. It has galvanized steel fan drive supports, not less durable painted steel. Grease fittings for the V-Belt drive bearings are on the outside; easier to get to. Then, corrugated rather than flat asbestos cement board casing gives a more attractive appearance."

"That's four."

"Let's see. Five, asbestos cement board louvers are standard, not special equipment. Then, with the LoLine, you get an internal pipe supply system. Piping is concealed. Last, the V-Belt drive has a stainless steel fan shaft. Lasts far longer."

J. F. PRITCHARD & CO. OF CALIFORNIA
4625 Roanoke Parkway, Kansas City 12, Mo.

"The Pritchard LoLine is 7 ways better than what?"



PRITCHARD LOLINE® HAS LOWEST SILHOUETTE OF ANY TOWER 75 TONS AND UP!

The Pritchard LoLine Tower is the lowest silhouette tower of all. Just 7′, 7 11/16″ over-all height. Thus, it best meets the needs of architects in planning for suburban or metropolitan buildings.

Besides that, the LoLine has:

- **Select Heart redwood or better in all framework. Framework is surfaced, machine fabricated for precision fit.**
- **Each set of louvers has slip-fit inserts of cement asbestos board, individually removable.**
- **Simple drive design, ruggedly supported by hot-dip galvanized structural members.**
- **Complete line of accessories.**

SEND FOR COMPLIMENTARY COPY OF LOLINE® BULLETIN

Describes many unique design features in detail. Cross-sectional drawings. Photographs of construction features. Capacities. Optional equipment. Write today—on your company letterhead for this bulletin!

INDUSTRY'S PACEMAKER FOR PROGRESS

J.F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 467, 4625 Roanoke Parkway
Kansas City 12, Missouri

COOLING TOWERS * GAS & AIR TREATING EQUIPMENT
REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

EQUIPMENT DEVELOPMENTS

Continued

or air cooled condensers. Water cooled units have 20,000 to 63,000 Btu per hr heat transfer ratings. Air cooled units for remote mounting.

Equipment Briefs . . .

HYDRO-ELECTRIC WORK TOWER for one man use—Safway Steel Products, Inc., 6234 W. State St., Milwaukee 13. Powered by ¾ hp single phase electric motor. Can be plugged into any 110 volt a-c outlet. Hydraulic pump raises work platform 7 to 17 ft above floor in 25 sec, says company. Capacity is 400 lb.

240 *VOLT CABLE* for both dry wall, plaster construction—Modernheat Corp., Kingsport, Tenn. Due to polyvinyl chloride insulation being covered with nylon coating, cable has higher heat resistance, says company. Covering is also said to lessen possibility of damage during installation.

COLD CLEANERS for metalworking, machinery—Manufacturers Processing Co., 1360 Hilton Rd., Detroit 20. Line made up of cleaners said to be fast drying, nontoxic, nonflammable for variety of metal cleaning operations. Formulated in five types.

ENDLESS PIPE laying method, without joints, designed for speed of several miles per hour—Bjorksten Research Laboratories, Inc., Madison, Wis. Method utilizes plastic pipe extruder placed on tractor. As tractor advances, extruder is also moved forward. Pipe is thus laid at same rate as tractor moves, says company.

WALL HEATER with anodized aluminum heating surface—Marviray, Inc., 54 Clifton St., Newark 5. Maximum heat transfer provided because of unique method of heat distribution, says company.

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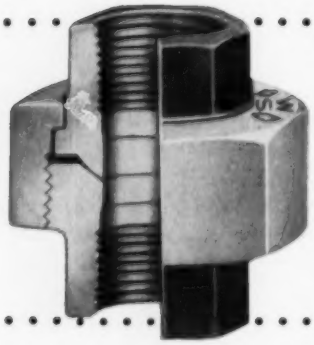

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RECENT TRADE LITERATURE...

▸ *AIR CONDITIONING*—"Incremental System" of year 'round air conditioning for multiroom buildings discussed in form 5916. System recommended by company for installation in both new and existing structures. Remington Air Conditioning Div. of Remington Corp., Auburn, N.Y.

▸ *AIR CONDITIONING*—New bulletins from manufacturer detail features of packaged air conditioner, "Flexi-Cool" conditioner, and induction circulators. Literature illustrates installations, cites features. Worthington Corp., Harrison, N.J.

▸ *AIR CONDITIONING, REFRIGERATION*—Bulletin 80-D is 32 page catalog detailing company's air conditioning, refrigeration equipment. Discusses uses, operating principles, features, etc. Frick Co., Waynesboro, Pa.

▸ *AIR CONDITIONING TIME CONTROLS*—Bulletin No. 511 discusses time switches designed for on-off control of air conditioning systems. Lists various dials available, other pertinent information. Tork Clock Co., Inc., Mount Vernon, N.Y.

▸ *AIR METER*—"Anemotherm" meter with pushbutton operation for measuring air velocity, temperature, static pressure in heating, ventilating, air conditioning systems discussed in bulletin No. 55. Anemostat Corp. of America, 10 E. 39th St., New York 16.

▸ *ALUMINUM INSULATION*—Form BP 315F describes advantages of aluminum reflective insulation. Type "B" is paper covered with aluminum foil on one side, type "C" is covered on both sides. Reynolds Metals Co., 2500 S. Third St., Louisville 1.

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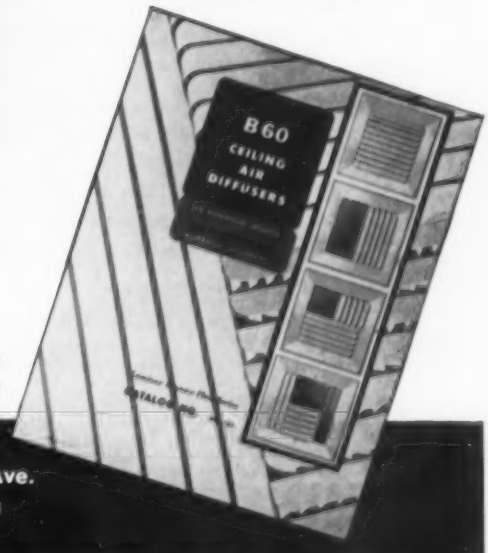

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▸ *ARC WELDING*—New 8 page bulletin discusses applications of company's "Idealarc" welder. Lists features, illustrates uses. Discusses selective control switch designed to choose soft or forceful arc in both a-c, d-c welding. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17.

▸ *BRAZING*—New 4 page folder describes, illustrates applications of "Sil-Fos" low temperature silver brazing alloy. Handy & Harman, 82 Fulton St., New York 38.

▸ *CONTROLLED VOLUME PUMPS*—New 4 page bulletin details operation, application of controlled volume pumps for "downhill" metering of liquids, gases. Provides specifications, capacities, features. Milton Roy Co., 1300 E. Mermaid Ln., Philadelphia 18.

▸ *CONTROL OF DIRECT RADIATION*—Data sheet CA-12 discusses control of heating systems using either steam or hot water. Barber-Colman Co., Rockford, Ill.

▸ *CONTROLS—Automatic Controls Improve Water Supply Service* is title of article illustrating advantages of automation in water supply, sewage fields. Automatic Control Co., 995 University Ave., St. Paul 4.

▸ *CONTROLS*—Company's line of furnace controls described in catalog. Specifications given for room thermostats, fan and limit controls, combination controls, solenoid valves, damper packages, zone control systems. Crise Controls Div., Acro Mfg. Co., Columbus 16, Ohio.

▸ *COOLING, HEATING*—Method of air conditioning schoolrooms described in new bulletin. Discusses unit for year 'round cooling, heating, ventilating, air conditioning in mild climate areas where heating require-

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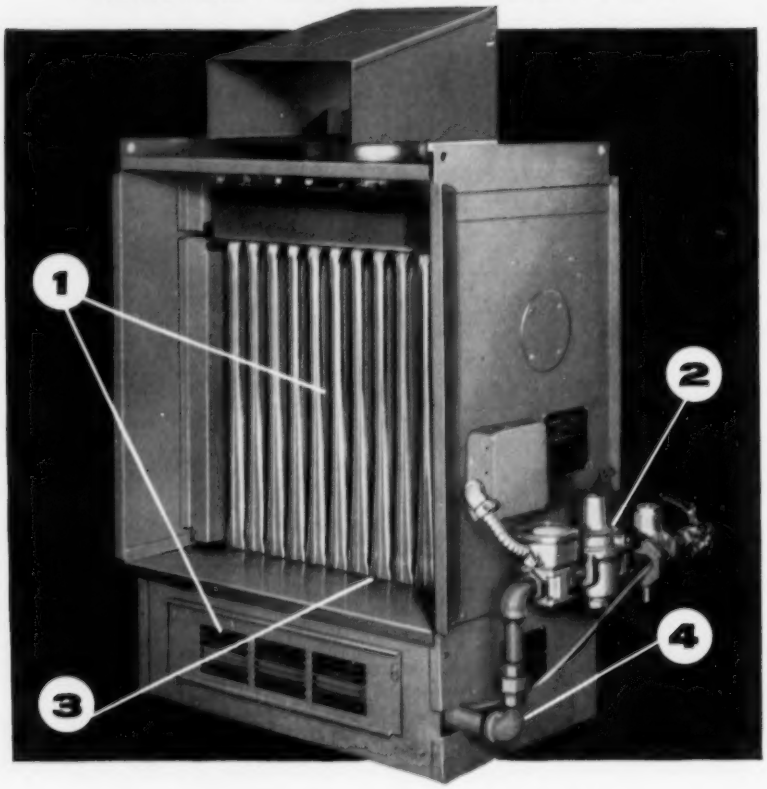

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RECENT TRADE LITERATURE

Continued

ments minimum, cooling problems critical. Herman Nelson Unit Ventilator Products, American Air Filter Co., Inc., Louisville 8.

▸ *COOLING, HEATING EQUIPMENT*—Packaged cooling, heating equipment for stores, offices, industry is subject of new 12 page bulletin. Literature contains information about features, dimensions, capacities. Specification sheets also available. Worthington Corp., Harrison, N.J.

▸ *CUTTING MACHINE*—New 20 page catalog describes operating, construction features of "Airco No. 50 Travograph" oxyacetylene multiple torch shape cutting machine. Includes information covering tracers, regulators, gas distribution systems, cutting torches, tips. Air Reduction Sales Co., 60 E. 42nd St., New York 17.

▸ *DIFFUSERS, REGISTERS, GRILLES*—New 52 page catalog 56-AC describes company's diffusers, registers, grilles. Details capacities, sizes, engineering data, prices. Air Control Products, Inc., Coopersville, Mich.

▸ *ELECTRIC HEAT*—New 16 page booklet describes, illustrates applications of electric heat for wintertime industrial use. Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8.

▸ *ELECTRIC MOTORS*—Brochure No. 1700 includes illustrations, information on open dripproof, enclosed and explosionproof electric motors constructed to new NEMA standards. Louis Allis Co., 427 E. Stewart St., Milwaukee 7.

▸ *FUEL GAGING SYSTEMS*—Bulletin 546 covers "Liquidometer" capacitor type fuel gaging systems. Describes true weight gaging systems, compensated and uncompensated capacitor type fuel gages, repeater indicators, fuel gage totalizing systems,

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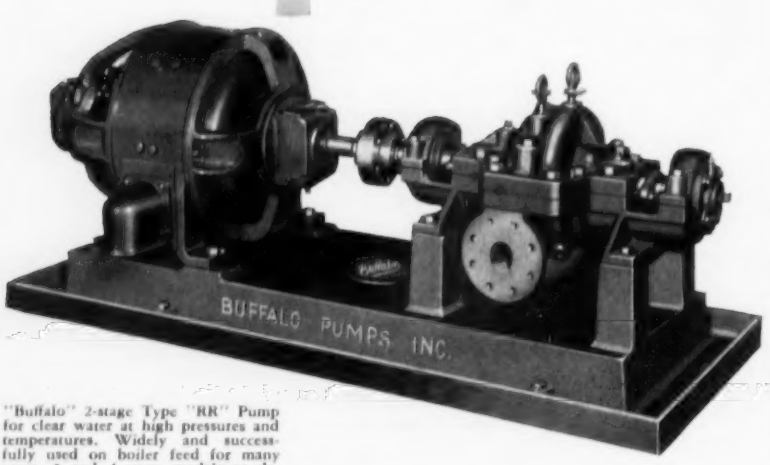

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RECENT TRADE LITERATURE

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selective indicators, thermistor applications for fuel level warning and control. Liquidometer Corp., Skillman Ave. and 36th St., Long Island City 1, N.Y.

▸ *GASOLINE ENGINE TOOLS*—New 63 page catalog 32 describes, illustrates company's line of portable gasoline engine tools such as pumps, generators for industry. Mall Tool Co., 7725 South Chicago Ave., Chicago 19.

▸ *HEAT EXCHANGERS*—New 32 page technical catalog has curves and examples to give picture of performance of company's heat exchangers under varying field conditions. Also compares various types of shell and tube heat exchanger equipment. E. C. Cooley Co., 1186 Folsom St., San Francisco.

▸ *HEATING*—Application of "Selec-Temp" heating system to motels covered in 8 page bulletin No. 5235. Method of controlling room temperature described. Advantages of combined steam, forced warm air heating outlined. Iron Fireman Mfg. Co., 3170 W. 106th St., Cleveland 11.

▸ *HOSE, DUCT*—Bulletin 60 provides information, on "Flexaust" hose, "Portovent" duct for conveying air, dust, fumes, materials via pressure, suction or gravity. Flexaust Co., 100 Park Ave., New York 17.

▸ *INSTRUMENTS*—Pyrometers, thermometers, thermocouples, air velocity meters, dewpoint indicators illustrated, detailed in 8 page catalog. Capacity data given for each instrument. Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago 10.

▸ *INSULATION*—New 4 page folder lists advantages of "Styrofoam" for insulation. Compares it to other insulations. Dow Chemical Co., Midland, Mich.

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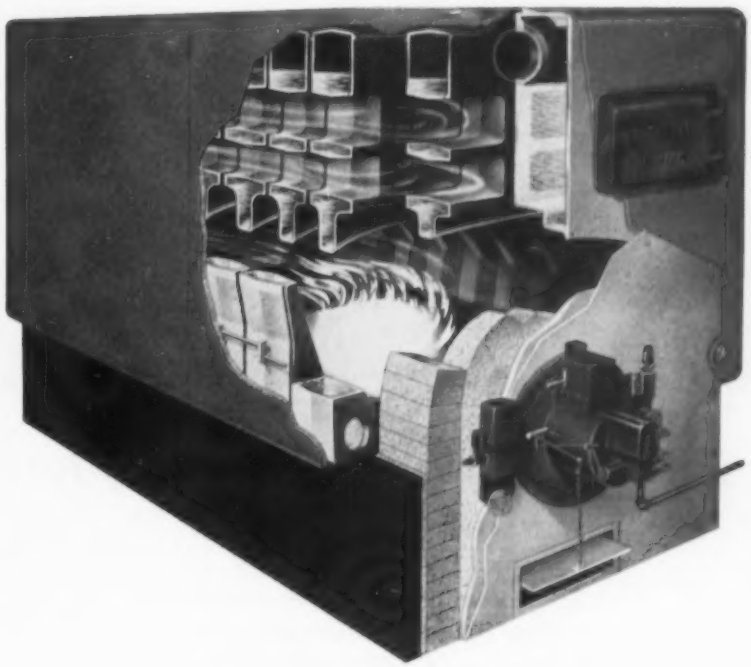

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RECENT TRADE LITERATURE

Continued

▸ *INSULATION*—New 4 page folder describes "Microlite" and "Super Fine" glass fiber insulation for heat control, sound absorption. Presents performance, conductivity charts for insulating blankets, describes their properties and uses. L.O.F Glass Fibers Co., 1810 Madison Ave., Toledo 1.

▸ *INSULATION*—Bulletins Nos. 7, 8, 9 cover company's "Protektinsul" pipe covering finish, "Protekto-Flex" flexible duct and tube insulation, "Insul-Fil" pipe protection and insulation for underground steam distribution systems, respectively. Miracle Adhesives Corp., 214 E. 53rd St., New York 22.

▸ *LIQUID LEVEL*—Folder describes "Level-Eye," designed to show liquid level, cleanliness, gas-liquid ratio in refrigeration systems for temperatures—50 to 250 F. H.A. Phillips & Co., 3255 Carroll Ave., Chicago 24.

▸ *MOISTURE MEASUREMENT*—— How to measure water vapor, other gases is subject of 12 page bulletin. Discussed are gravometric, dew point, wet and dry bulb methods as well as some less used and experimental schemes. Pittsburgh Lectrodryer Corp., P. O. Box 1766, Pittsburgh 30.

▸ *PACKAGED BOILERS*—Packaged water tube boilers with capacities 8000 to 50,000 lb per hr of steam described in 12 page catalog 104-D. Literature includes data, dimensions. Superior Combustion Industries, Inc., 1475 Broadway, New York 36.

▸ *PIPE CUTTERS*—Folder contains data, illustrations covering application of company's manually operated cutters to field cutting of asbestos-cement pipe. Pilot Mfg. Co., 3970 Pacific Coast Hgwy., Torrance, Calif.

▸ *PIPING DIAGRAM, STEAM TRAP SELECTOR*—New 12 page

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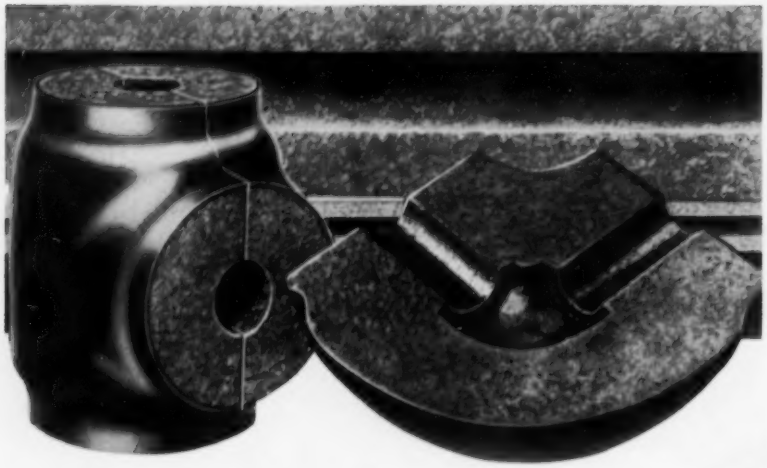
Each hermetic motor is carefully packaged in a heavy fibre-board box . . . all are carefully wrapped in a plastic blanket. Further protection from moisture is obtained by insertion of individual bags of silica jel.



UNITED CORK PIPE COVERING

Light Duty Thickness (Ice Water)	to 30° F
Medium Duty Thickness (Brine and Ammonia)	to 0° F
Heavy Duty Thickness (Heavy Brine)	to —25° F or lower

For all standard pipe sizes and fittings. Molded of compressed pure granulated cork, finished with moisture-proof mineral mastic.

LARGER STOCKS...FASTER DELIVERY...PERSONAL SERVICE

United Cork Companies have expanded their facilities to include the production of cork pipe covering. Increased quantities of most frequently used sizes are now available at key points coast to coast . . . in either distributor or branch warehouse stocks . . . thus insuring fast delivery of your installation requirements.

CORK. . . STILL UNSURPASSED AS A COLD LINE INSULATOR

- Extremely low thermal conductivity
- Saves at least 80% of refrigeration lost from bare piping
- Easily economically applied
- Permanent and durable, lowest long-term cost
- Does not support combustion
- Neat, sanitary, vermin-proof
- Has no capillarity

YOUR INQUIRY will bring you specifications, helpful installation data, descriptive material on United's cork pipe covering . . . and patented BB (block-baked) 100% Corkboard specially processed for low temperature work. No obligation.

UNITED BB CORKBOARD

SEE OUR CATALOG IN SWEET'S

UNITED CORK COMPANIES

1 CENTRAL AVE., KEARNY, NEW JERSEY

Manufacturers of cork insulation for almost a half century

Engineering offices, or approved distributors, in key cities — coast to coast.

RECENT TRADE LITERATURE

Continued

bulletin designed to aid in selection, application of steam traps on chemical processing equipment. Features three page piping diagram. Contains trap selector tables. Yarnall-Waring Co., Chestnut Hill, Philadelphia 18.

▸ *PORTABLE AIR HEATERS*—*Guide to the Selection and Use of Portable Space Heaters* is booklet telling what is safe and what is not safe in use of portable heaters. American Air Filter Co., Inc., Moline, Ill.

▸ *PRESSURE SWITCH*—Bourdon tube pressure switches for intermediate or high pressure control systems illustrated, discussed in 6 page brochure. Barksdale Valves, 5125 Alcoa Ave., Los Angeles 58.

▸ *PUMPS*—Small rotary displacement and centrifugal pumps for chemical service described, illustrated in revised bulletin. Table of recommended uses, specifications for each unit, illustrations of conventional drives and mountings included. Eco Engineering Co., 12 New York Ave., Newark 1.

▸ *REFRIGERATION*—Catalog for 1956 covers company's line of dryers, strainers, cap tubes, plus new equipment added. Units illustrated, accompanied by specification tables. Wabash Corp., 2300-18 S. Western Ave., Chicago 8.

▸ *REMOTE AIR CONDITIONING*—New 16 page bulletin details construction, operation, application of "Seazonaire" remote room air conditioning units. Units individually controlled for hotels, motels, institutions, office buildings, other multiple installations. Marlo Coil Co., 6137 Manchester Ave., St. Louis 10.

▸ *SEALING TAPE*—Case history bulletin describes use of sealing compounds in construction of a warehouse subjected to high winds, severe

The Sign of Quality Motor Control

Governair model SCU-25, 25-ton packaged air conditioner uses Allen-Bradley Bulletin 709 solenoid starters in sizes 0, 1, and 3.

Governair model PWD-30, 30-ton packaged water chiller uses Allen-Bradley Bulletin 709 solenoid starters in sizes 1 and 3.

ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS ARE "STANDARD"

ON GOVERNAIR *Refrigeration Units*

REASONS WHY ALLEN-BRADLEY STARTERS ARE FIRST WITH REFRIGERATION AND AIR-CONDITIONING MEN

simple design

Only ONE moving part . . . the secret of trouble free switch operation.

dependable operation

No pivots, pins, hinges, or friction parts to cause starter trouble.

maintenance free contacts

Double break, silver alloy contacts never need cleaning or filing.

reliable overload relays

Provide continuously reliable motor protection irrespective of service.

Year after year Allen-Bradley controls gain in popularity especially among air-conditioning and refrigeration men . . . and there are good reasons. Allen-Bradley controls give continuously dependable service without maintenance over long periods of operation.

Extreme simplicity enables Allen-Bradley solenoid starters to provide trouble free service . . . only ONE moving part.

There are no hinges or pivots to bind and cause trouble . . . no pins or bearings to wear. And the cadmium silver alloy contacts never need cleaning, filing, or dressing. You can install Allen-Bradley controls . . . and forget them. Specify Allen-Bradley control—it stands for millions of trouble free operations.

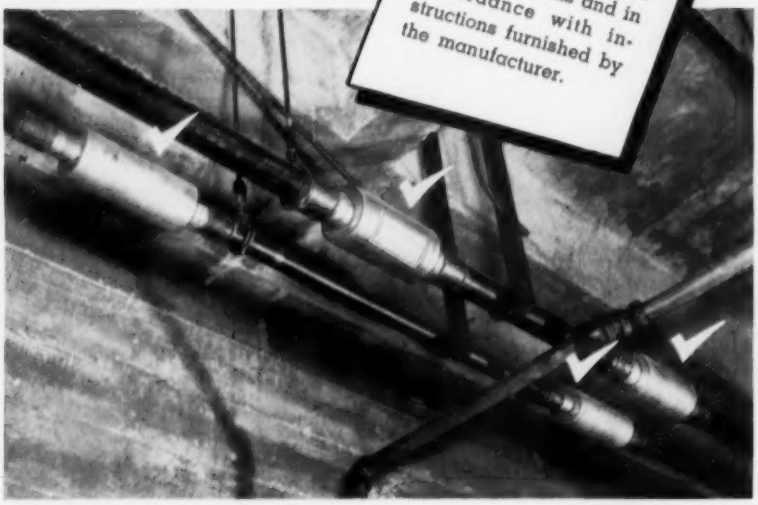
Allen-Bradley Co., 1335 S. First St.
Milwaukee 4, Wis.
In Canada—
Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

WHEN YOU SEE

This specification

The contractor shall furnish and install suitable devices for control of expansion in all heating system risers and distribution lines as shown on plans and in accordance with instructions furnished by the manufacturer.



The most satisfactory answer is the Flexon® Expansion Compensator

For Medium and High Pressure Piping—

FLEXON® EXPANSION JOINTS

FREE FLEXING TYPE—Available in sizes from 3" through 48", I.D. For pressures to 50 psi and temperatures to 850° F.

CONTROLLED FLEXING TYPE—Available in sizes from 3" through 24", I.D. For pressures from vacuum to 300 psi and temperatures to 850°F.

DESIGN GUIDE—The Flexon Expansion Joint Design Guide is a 24 page handbook on the selection and application of expansion joints. Write for your free copy, today.

Flexonics Corporation provides the complete package to solve expansion control problems in steam and hot water heating systems—a low pressure unit for horizontal runs . . . a high pressure type for risers or horizontal runs.

Ideally suited for all types of buildings, Flexon Expansion Compensators eliminate the noise of pipe creeping and assure long leakproof service. The units have been especially designed to replace outmoded, troublesome methods of pipe line expansion control. They are space savers and easily installed, becoming an integral part of the pipe line. No access panels are required because there is no maintenance for the life of the heating system.

Bulletin 151, a detailed guide to specification of heating system expansion control is available upon request.

EC-16

FLEXON® QUALITY proved in service and backed by over 54 years manufacturing experience

Flexonics *Corporation*

EXPANSION JOINT DIVISION

1391 S. THIRD AVENUE, MAYWOOD, ILLINOIS

FORMERLY CHICAGO METAL HOSE CORPORATION

Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

RECENT TRADE LITERATURE

Continued

dust problems. Illustrates actual application, discusses features of tape. Presstite Engineering Co., 3798 Chouteau Ave., St. Louis 10.

▸ *THERMOCOUPLES*—Data sheet No. 8553 covers technical data on company's three basic types of multipoint thermocouple assemblies. Trinity Equipment Corp., Roselle Park, N.J.

▸ *TUBING*—Bulletin TB-357 contains information on tubular products for sub-zero temperature applications in its 6 pages. Tubular Products Div., Babcock & Wilcox Co., Beaver Falls, Pa.

▸ *V BELTS*—Data sheet discusses company's "Multi-V" belts with special grommet construction. Design is said to lengthen life of belts, give them greater strength. Industrial Products Div., B.F. Goodrich Co., Akron.

▸ *V BELTS*—Care, maintenance of v belts discussed in 14 page manual. Literature covers: designing the new drive; double matching, installation of belts; how v belts grip; importance of tension; drive alignment; how to clean; storage. Industrial Products Div., B.F. Goodrich Co., Akron.

▸ *VALVES*—New 12 page catalog lists company's line of more than 150 valves. Provides specifications, data. Sizes, applications for each valve given in chart form. Milwaukee Valve Co., 2375 S. Burrell St., Milwaukee 7.

▸ *VIBRATION HANGERS*—Heavy duty vibration hangers, designed to prevent transmission of noise and vibration and to flexibly support piping systems, described in catalog VH-55. Rubber-in-shear and steel spring

Economical Solution

to a wide variety of heating problems...

GENERAL

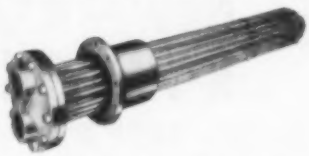
Hot Water Converters

2 TYPES (Steam or Boiler Water) — Steam Type Shown

...and these other dependable GENERAL products

Instantaneous Water Heaters — Modern hot water supply for plant wash rooms, processes, cafeterias, hospitals, and other industrial, commercial, or institutional needs.

Fuel Oil Heaters — 5 Types. Oil-through-shell or oil-through-tubes — U-tube or straight tube.



Tank-Heating Units — 54 sizes for all requirements.

You will find successful applications of GENERAL Converters in heating systems for widely varied services ... from factory offices to greenhouses ... schools to swimming pools. These modern converters are specifically designed for high-efficiency transfer of heat from steam or boiler water to serve separate heating systems. And whether the job is heating an apartment building or melting snow, they do it effectively ... economically.

GENERAL Converters are made with welded steel shell, copper tubing, and non-porous, cast iron heads. Gasket surfaces are machined ... tubing is *electronically* expanded into tube sheets. And every unit is tested 300# air-under-water both shell and tubes. The pay-off is long, troublefree performance. Send for complete details on GENERAL Converters and the other GENERAL Products shown above. Just clip and mail coupon below.

GENERAL FITTINGS COMPANY

Manufacturers of Instantaneous Water Heaters, Converters, Fuel Oil Heaters, and Heating Specialties

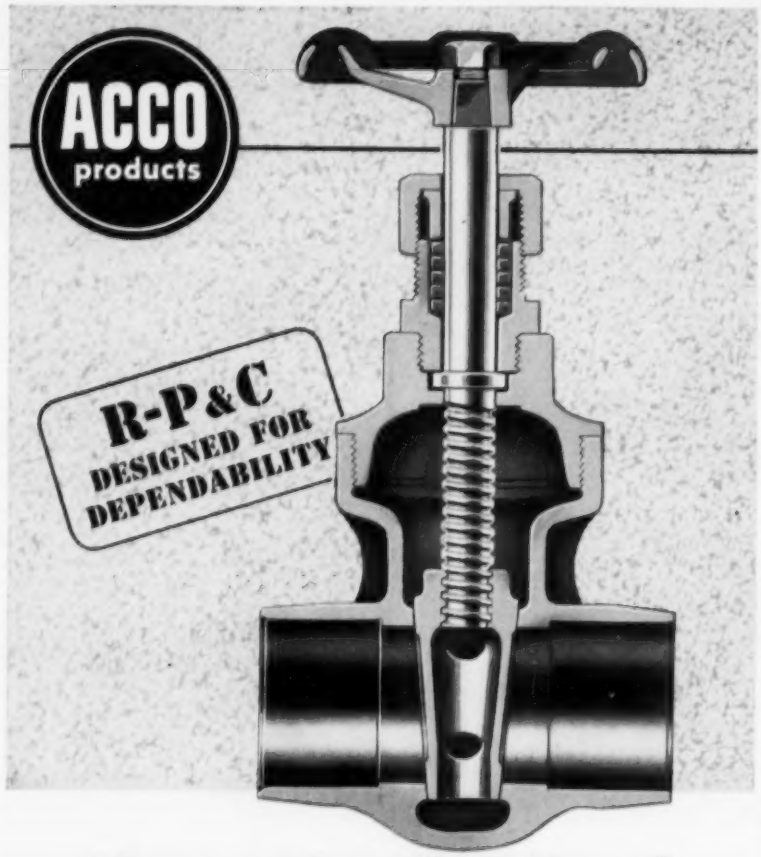
GENERAL FITTINGS COMPANY
Box 151E, East Greenwich, R. I.

Please send me Catalogs 45C, 61 and 64

NAME _____

ADDRESS _____

_____

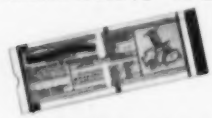


Now—a Complete Line of R-P&C Solder End Valves

BRONZE GATES, GLOBES, CHECKS

• Now you can get R-P&C solder end valves similar to the **Fig. 90 gate valve** above in globe valve and check valve styles. They have been especially developed for use with K, L or M copper tubing on hot and cold water, or low pressure steam lines in plumbing, heating and air conditioning systems.

All are rated for 125 lbs. in steam service, or 200 lbs. with oil, water or gas. Gates are provided in sizes from ⅜″ to 3″, globes from ¼″ to 2″, checks from ⅜″ to 2″.



FREE SLIDE RULE

Valve selector slide rule gives all dimensions for iron body and steel valves in pressure classes from 150 to 1500 lbs. Write for yours.

These new valves reflect the quality construction features, typical of the complete R-P&C line, which result in longer life, lower maintenance and easier installation. They are presented in a wide range of styles—for example, the gate valves are supplied with either rising or stationary stem, and solid or split wedge. Each valve is hydrostatically tested at a pressure of 350 pounds before leaving the factory.

Your R-P&C distributor has these valves in stock now—or he can get them for you. Write Reading office for complete catalog.

ACCO

R-P&C Valve Division
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

R-P&C valves

RECENT TRADE LITERATURE

Continued

types detailed. T.R. Finn & Co., 200 Central Ave., Hawthorne, N.J.

▸ *SEAMLESS WELDING FITTINGS*—New 6 page bulletin FB-500 describes various welding fittings, flanges in alloy, carbon, stainless steel. Tubular Products Div., Babcock & Wilcox Co., Beaver Falls, Pa.

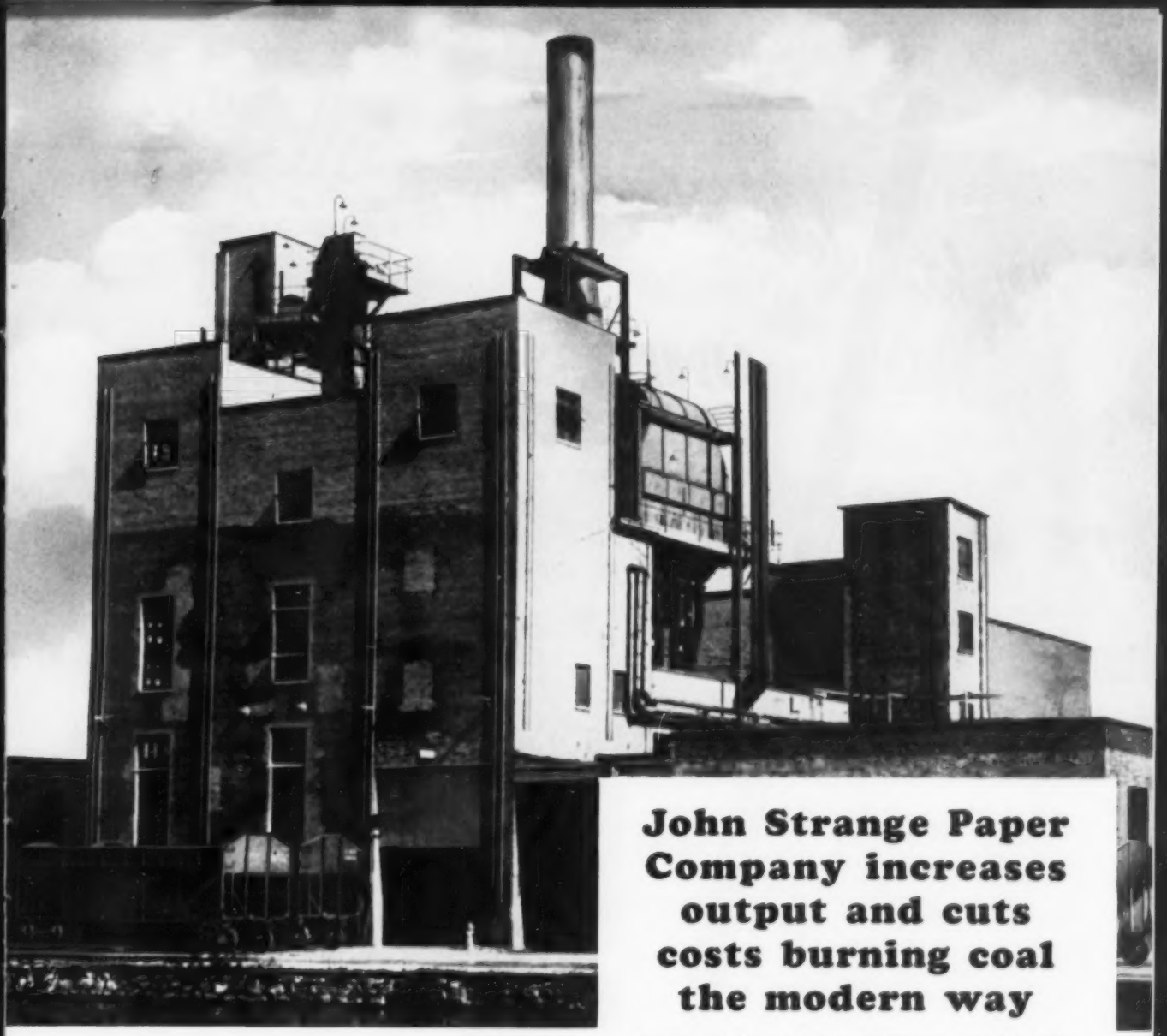
▸ *SOLENOID PILOTS*—New 4 page bulletin describes several types of solenoid pilot for use with company's regulating valves. Contains schematic diagrams of typical applications. Spence Engineering Co., Inc., Walden, N.Y.

▸ *SOLENOID VALVE*—Form V5010 is technical bulletin covering midget three-way solenoid valve. Pressure ratings, flow conditions provided. Form V5006 discusses 1 in., two-way unit for handling corrosive fluids, gases. Automatic Switch Co., 391 Lakeside Ave., Orange, N.J.

▸ *STAINLESS STEEL VALVES*—New 4 page bulletin K describes, illustrates additions to company's line of stainless steel valves. Presents complete specifications, details. J. D. Gould Co., 730 E. Washington St., Indianapolis 2.

▸ *STEAM GENERATORS*—Packaged water tube steam generators detailed in 14 page bulletin 5511. Units produced with steam capacities 7500 to 40,000 lb per hr of steam. Bulletin includes technical data, dimensional information, illustrations of components. Titusville Iron Works Co., Titusville, Pa.

▸ *TACHOMETERS*—Stationary tachometers designed with new circuits, takeoff heads for longer life discussed in bulletin No. 105. Metron Instrument Co., 432 Lincoln St., Denver 3. ≠



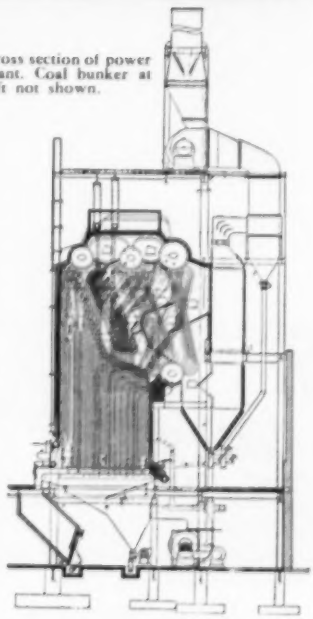
John Strange Paper Company increases output and cuts costs burning coal the modern way

Steam and electric power represents a considerable percentage of overall costs in paper mill production. In addition to this cost problem, the power plant of the John Strange Paper Co., Menasha, Wis., lacked sufficient capacity to meet the mill's demand for steam and power.

In an effort to trim costs and increase capacity, the company called in the consulting firm of Cummins & Barnard, Inc., Ann Arbor, Mich., to recommend a modernization program. Based on those recommendations, today John Strange burns coal in highly efficient steam-generating equipment. The remodeled installation includes completely modern coal-handling and pneumatic ash-handling equipment as well as two automatic control systems. Costs have been curtailed; steam and power supply is dependable. Most important, the mill machinery operates at higher speed, resulting in a 10% increase in production.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
Southern Building, Washington 5, D. C.



Cross section of power plant. Coal bunker at left not shown.

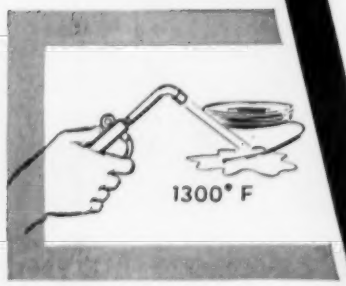
facts you should know about coal

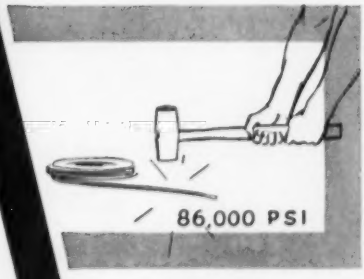
In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum • Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

Right down the line

UNITED'S PHOSON alloys

Right every time for brazing copper and brass

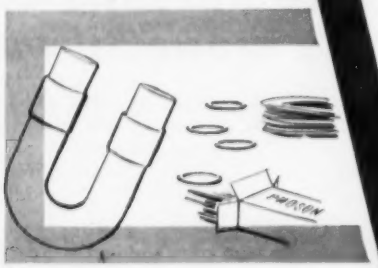




Here's Why:

Lowest practical brazing temperatures. There's a Phoson Alloy to meet your every requirement.

Super-Strength—Corrosion Resistant. Joints are stronger than metals brazed. Original tensile from 86,000 p.s.i. Highly resistant to most types of corrosion and generally equal to copper itself.



Join better by brazing
Join best with PHOSON or SIL-BOND.

Choose Sil-Flux for every fluxing need.

High Capillary Attraction and Versatility. Provides outstanding free flow and deep penetration. Ideal for preplacement or face-fed application. Efficient in both tightly-fitted or more loosely-fitted joints. Phoson Alloys are available in straight lengths, coils or preformed rings. *Contact your United Welding Supply Distributor or write*

Permanently United

UNITED WIRE

AND SUPPLY CORP.
Brazing Alloy Division
PROVIDENCE 7, R. I. • OFFICES IN PRINCIPAL CITIES

BOOTH 22
WELDING SHOW
MEMORIAL AUDITORIUM
BUFFALO, N. Y. • MAY 9-11, 1956

LOOK TO UNITED FOR THE BEST IN ALUMINUM, COPPER AND BRASS TUBE AND WIRE.

WHO'S WHAT . . .

(New personnel, promotions)

▸ *ROBERTSHAW-FULTON CONTROLS CO.*—Clarence Wantz, chief engineer in charge of the engineering department of the Robertshaw Thermostat Div.; Woodford D. Miller, executive vice president in charge of eastern operations; Frank H. Post, vice president and general manager of the Robertshaw Thermostat Div.; George Mertz, assistant to the general manager of Robertshaw Thermostat Div.; Freeman G. Cross, will succeed Jean V. Giesler, retired, as general manager of the Fulton Sylphon Div.

▸ *WARREN WEBSTER & CO.*—Arnold Richard Webster, executive vice president. The board of directors announced the resignation of Andrew B. Young, junior vice president, and the retirement at the end of the year of E. Kessler Webster, senior vice president.

▸ *MUELLER BRASS CO.*—James D. MacFarland, sales representative.

▸ *EDWIN B. ROOT*—Consulting engineer, to devote full time to private practice after his resignation from Superior Safety Furnace Pipe Co.

▸ *BALTIMORE AIRCOIL CO.*—W. E. Kahlert, vice-president in charge of sales.

▸ *MULTIPLE V BELT DRIVE & MECHANICAL POWER TRANSMISSION ASSOCIATION*—Joseph E. Maurey of Maurey Mfg. Corp., president; H. Merrill Bowman of American Pulley Co., vice president.

▸ *DELAVAN MANUFACTURING CO.*—Kenneth B. Luskin, administrative assistant to the vice president.

All season sensation!

NEW Mueller Climatrol recessed room air conditioner

HEATS
with steam or hot water in commercial and institutional buildings.

COOLS
with its own air-cooled, one-hp refrigeration cycle.

SAVES
up to 50% on installation . . . 20% on operating costs.

EVERY room with its own thermostat-controlled heating-cooling system! New Mueller Climatrol recessed air conditioner is compact, attractive, conceals ugly piping . . . heats, cools and dehumidifies . . . ventilates with fresh outdoor air . . . exhausts stale air. Windows can be kept locked and sealed, preventing entrance of "downtown dirt."

No water — a boon in areas where water cannot be used for air conditioning. Efficient one-hp refrigeration cycle is air-cooled . . . requires no plumbing or drainage.

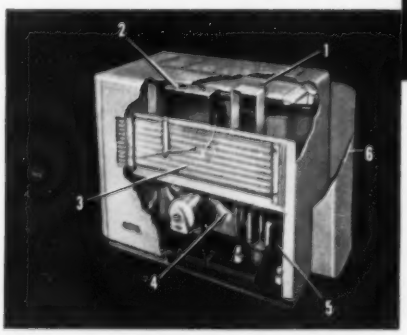
Of course, you'll want full details. Write Mueller Climatrol, 2023 W. Oklahoma Ave., Milwaukee 15, Wisconsin.

Mueller Climatrol

compact inside

. . . flush outside

. . . quality-built throughout



1. Hot water or steam coil provides even heat, gently circulated by big-twin centrifugal blowers for perfect comfort.

2. Individual room temperature control is easy with push-button selector. Heating-cooling thermostat provides uniform comfort.

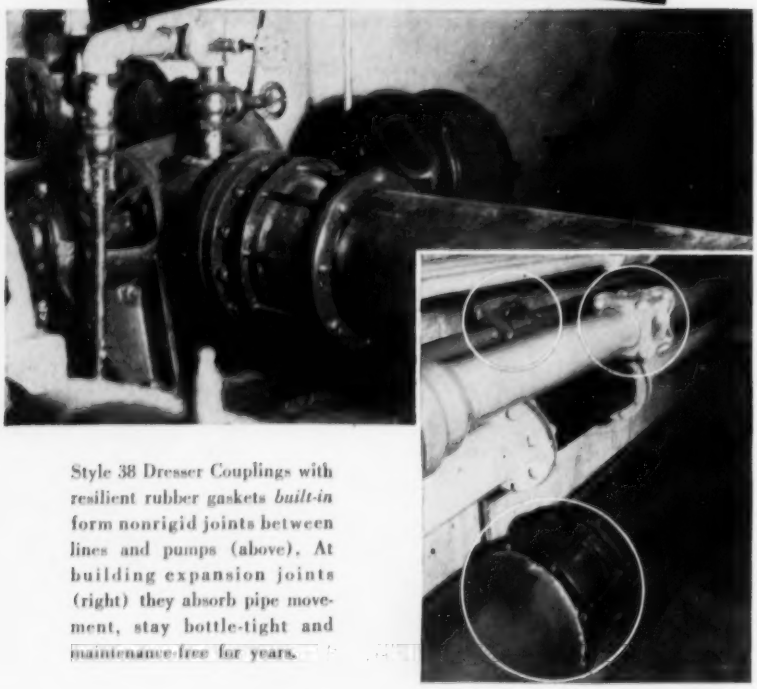
3. Full-width cooling coil has extra capacity for even air distribution, ample dehumidification.

4. Propeller fan exhausts heat from condenser coil and dissipates condensate . . . can be used to exhaust stale room air.

5. Entire one-hp refrigeration cycle mounted on easy-to-remove frame. No need to disturb heating coils or piping to remove cycle for service.

6. Chases completely conceal supply and return pipes, valves, etc.; make attractive installation.

FOR INDUSTRIAL PIPING . . .
the DRESSER way
is *Easier . . . Surer!*



Style 38 Dresser Couplings with resilient rubber gaskets *built-in* form nonrigid joints between lines and pumps (above). At building expansion joints (right) they absorb pipe movement, stay bottle-tight and maintenance-free for years.

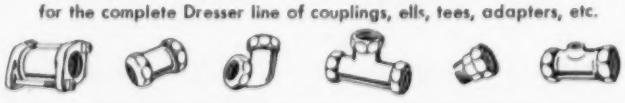
Whatever, wherever your pipe-joining jobs, Dresser Couplings mean time and money saved!

No troublesome aligning and joining problems, no complicated or costly operations. All you have to do is bring plain pipe ends together, Dresser-couple them, tighten the bolts with a wrench . . . and the job is finished. Dresser Couplings' resistance to impact, vibration and corrosion means highest dependability. Well suited to plant installations, they're easy to take off and transfer.

Style 65 Fittings come in sizes from ⅜″ to 2″; Style 38 Couplings are available to 12″ OD and over.

SEE YOUR LOCAL PIPING SUPPLIER TODAY

for the complete Dresser line of couplings, ells, tees, adapters, etc.



DRESSER®

ONE OF THE DRESSER INDUSTRIES

Dresser Manufacturing Division, 79 Fisher Ave., Bradford, Pa.

WHO'S WHAT

Continued

▸ *NATIONAL ASSOCIATION OF CORROSION ENGINEERS*—Aaron Wachter, 1955 outstanding service award of western region; Norman Hackerman, 1956 Whitney award; Mars G. Fontana, 1956 Speller award. Officers elected for 1956-57: W. F. Fair, Jr., Tar Products Div., Koppers Company, Inc., president; W. H. Stewart, Sun Pipe Line Co., vice president; R. A. Brannon, Humble Pipe Line Co., treasurer. Also elected were three directors, H. L. Bilhartz, Production Profits, Inc., representing corporate members; Hugh L. Hamilton, A. V. Smith Engineering Co., and A. L. Stegner, Tennessee Gas Transmission Co., representing active members.

▸ *FEDDERS-QUIGAN CORP.*—Victor F. Melin, treasurer; Donald Jackson, director of consumer finance; U. V. Muscio and Victor F. Melin, elected to board of directors.

▸ *ALLIS-CHALMERS MFG. CO.*—Herbert K. Kingsbury, manager of product sales, centrifugal pump section for company's Norwood works.

▸ *INTERNATIONAL NICKEL CO., INC.*—Edmund M. Wise, assistant to the vice president-manager of the development and research division; Dr. George T. Paul, development and research division's engineering section; E. G. Holmberg, corrosion engineering section.

▸ *STEWART WARNER CORP.*—William E. Judd, general manager of the U. S. Machine Div. Mr. Judd will fill the vacancy to be created by the retirement of Carl J. Winkler, Sr.

▸ *HOOKER ELECTROCHEMICAL CO.*—Robert E. Wilkin, elected to board of directors, named vice president and director of sales.

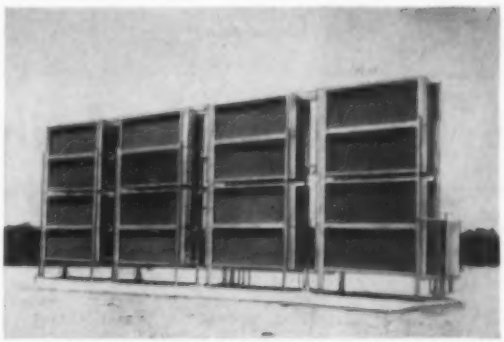
▸ *BELL & GOSSETT CO.*—Lee Wilson, manager of air compressor division.

Crashing the 100 ton barrier

with KRAMER

UNICON

in semi-tropical climate



UNICON SUCCESSFULLY MET THE TEST THROUGH THE SEVERE SUMMER OF 1955

You, too, can crash the big tonnage barriers with UNICON, the industry's finest remote-type air-cooled condenser. Put Kramer's 18 years of "treasured know-how" in the proper use of air as a condenser coolant to work for you.

Photo of Kramer UNICONS mounted on roof of Handy-Andy Supermarket in San Antonio, Texas, used with 100 ton air conditioning system. Supplied through United Supply Co., of San Antonio and installed under the direction of Harold Vogt.

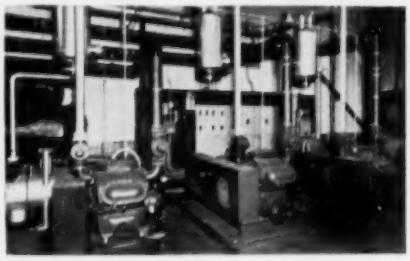
Write for Bulletin U-210-L

KRAMER

KRAMER TRENTON COMPANY
Trenton 5, New Jersey

▲ Baltimore Motor Vehicles Department whose personnel are now enjoying the comfort of Vilter Air Conditioning.

◀ Vilter Evaporative Condenser is mounted on the roof of a garage across the street from the department.



▶ These three 6-cyl. Vilter Multi-Cylinder compressors handle the 210-ton air conditioning load of the Baltimore Motor Vehicles Dept.

Q. How do you cool a hot spot ...in a hurry?

A. with Vilter AIR CONDITIONING EQUIPMENT ... that costs less to own*

When the heat's on weather wise and installation wise, a rapid moving team of trained Vilter field representatives and home office engineers can bring a wealth of broad, integrated experience to bear immediately on your problem.

Such was the case of the Baltimore Motor Vehicles Department whose officials early in the year decided to air condition their building ... wanting it in time for Summer. Prompt Vilter teamwork completed the job ahead of schedule.

This all Vilter installation includes three Multi-Cylinder compressors, an evaporative condenser, a flooded water chiller complete with heat exchanger and all necessary controls.

Success! This Vilter installation has provided the type of trouble-free cooling expected and the Baltimore people have expressed complete satisfaction with the equipment and handling of the job.

Vilter equipment, known and proven for over 88 years, is rugged, provides long years of dependable economical service and efficient operation—all pluses which make for a sound investment. Why don't you Standardize on Vilter, too?

* Savings in low first cost are not the complete answer when considering the installation of refrigeration equipment. But savings in terms of years of extra service, reliable performance and minimum maintenance—that's where Vilter excels in low-cost ownership.

Vilter® REFRIGERATION and AIR CONDITIONING

QUALITY CRAFTSMANSHIP that lasts...

ENGINEERING DESIGN that guarantees performance

THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin

Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

WHO'S WHAT

Continued

▶ *COBELL INDUSTRIES, INC.*—W. F. Wright, Jr., national sales manager of the gas air conditioning division.

▶ *COAL PRODUCERS COMMITTEE FOR SMOKE ABATEMENT*—R. L. Ireland, chairman of the general committee; Harry G. Kennedy, re-elected chairman of the executive committee; George G. Ritchie, re-elected secretary-treasurer.

▶ *CHASE BRASS & COPPER CO.*—George B. Moseley, vice president in charge of sales.

▶ *WILLIAM WALLACE CO.*—George B. McClellan, sales manager, succeeding A. L. Hawley, Jr., who has resigned.

▶ *JOSEPH T. RYERSON & SON, INC.*—Charles H. Hallett, manager of the Wallingford, Conn. plant.

▶ *O. A. SUTTON CORP.*—O. A. Sutton, elected to the board of directors of the National Association of Manufacturers. He will serve for the state of Kansas.

▶ *NORRIS-THERMADOR CORP.*—J. H. Butler, manager of evaporative cooler sales; T. C. Parker, director of market research.

▶ *HAJOCA CORP.*—J. W. St. Clair, president; W. A. Brecht, chairman of the board.

▶ *F. C. RUSSELL CO.*—William Tucker, president. Mr. Tucker will act as chief executive officer of the company.

▶ *CONOFLOW CORP.*—Joseph M. Heinhold, sales engineer.

▶ *NEWARK CONTROLS*—Paul W. Booth, vice president and director of engineering.

Keep Gimbels Comfortable

Dominating Milwaukee's Southgate Shopping Center, Gimbels five-million-dollar Suburban Department Store represents the latest developments in retail merchandising and department store design.

On the roof of the building sit twenty-two Gallaher power exhausters, out of view of the passers-by on U.S. Highway 41, the main route between Chicago and Milwaukee. Ranging in size from a 520 CFM unit to one that exhausts 23,000 CFM, these certified test-proven Air-Vans® ventilate the 200,000 square feet of floor space in the store.

John Lofte of Lofte & Fredericksen, the Milwaukee firm that planned the ventilating system at Gimbels, chose Gallaher Air-Vans® for several reasons. Low silhouette and heavy construction were what he was looking for. Gallaher had both. "Through prior use of the Gallaher exhausters, we have learned that we can rely on their performance," Lofte says.

In Gimbels new Milwaukee Suburban Store, twenty-two Gallaher Air-Vans® exhaust a total of 119,000 cubic feet of air per minute.

Gallaher units also have low noise levels and patented built-in scroll effect design, and they are available in special metals. The motor is out of the air stream, and the entire unit is shipped ready to install directly to the duct system. Lofte, like many other engineers, knew that Gallaher can be applied to almost any industrial or commercial ventilation problem.

Direct Drive units 150-11,000 CFM. Belt Drive 3500-65,000 CFM, developing static pressure to 4".

For further information write

Patents 2188741 2526290
Patents pending

The GALLAHER Company

4108 DODGE ST. OMAHA, NEBRASKA

Pioneers in Research-Designed Power Roof Exhausters

COOLING TOWER NEWS

Here's why Chicago's Hotel LaSalle chose a Binks tower—19 years later!

Last summer Chicago's Hotel LaSalle air conditioned its public rooms. To cool the large compressors the hotel purchased a 350-ton capacity Binks cooling tower...and for good reason:

Nineteen years ago—in 1937—the hotel erected a 200-ton Binks tower on the roof, 22 stories above the street, exposed to the Windy City's constantly changing weather. As can be seen in the above picture, that tower (left) is still in excellent condition. It gives the same high efficiency cooling that it did when it was new. Its maintenance has been economical in both time and dollars—despite its exposure to the elements for 19 years. With such time-tested proof of dependability, it is no wonder that the Hotel LaSalle chose Binks to supply its new tower.

Standardized models assure economy

Binks complete line of forced and natural draft cooling towers is built from standardized panels and parts. They are available in capacities from 3 to 1000 tons. These towers are engineered to provide the correct air-to-water ratios for proper cooling under your local conditions. They are ruggedly constructed of heavy gauge steel, protected from moisture and the elements by galvanizing and complete shop painting.

In Binks' wide range of Cooling Tower models there is one for nearly every size and type of installation... a tower that precisely fills your specifications without costly design or custom construction.

ENGINEERING HELP AVAILABLE

To help you select the right type and capacity tower a Binks Engineer will gladly study your needs and submit proposals without obligation. For full details, write to the address below:

609

Binks

EVERYTHING FOR WATER COOLING

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company

3118-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

WHO'S WHAT

Continued

▸ *A. O. SMITH CORP.*—F. S. Cornell, executive vice president and a director.

▸ *FOOD MACHINERY AND CHEMICAL CORP.*—Walter J. Blair, process pump specialist for the Peerless Pump Div.

▸ *AMERICAN GILSONITE CO.*—Arthur S. Klopf, manager of marketing.

▸ *NATIONAL BUREAU OF STANDARDS*—Robert S. Walleigh, assistant director for administration.

▸ *WESTINGHOUSE ELECTRIC CORP.*— John W. Craig, vice president of the company and general manager of its electric appliance divisions; Robert J. Moore, sales manager, packaged products for the Westinghouse air conditioning division at Staunton, Va.

▸ *SORENG PRODUCTS CORP.*—George D. Becker, executive vice president.

▸ *BURNHAM CORP.*—Donald E. Hawk, sales manager of the steel boiler department.

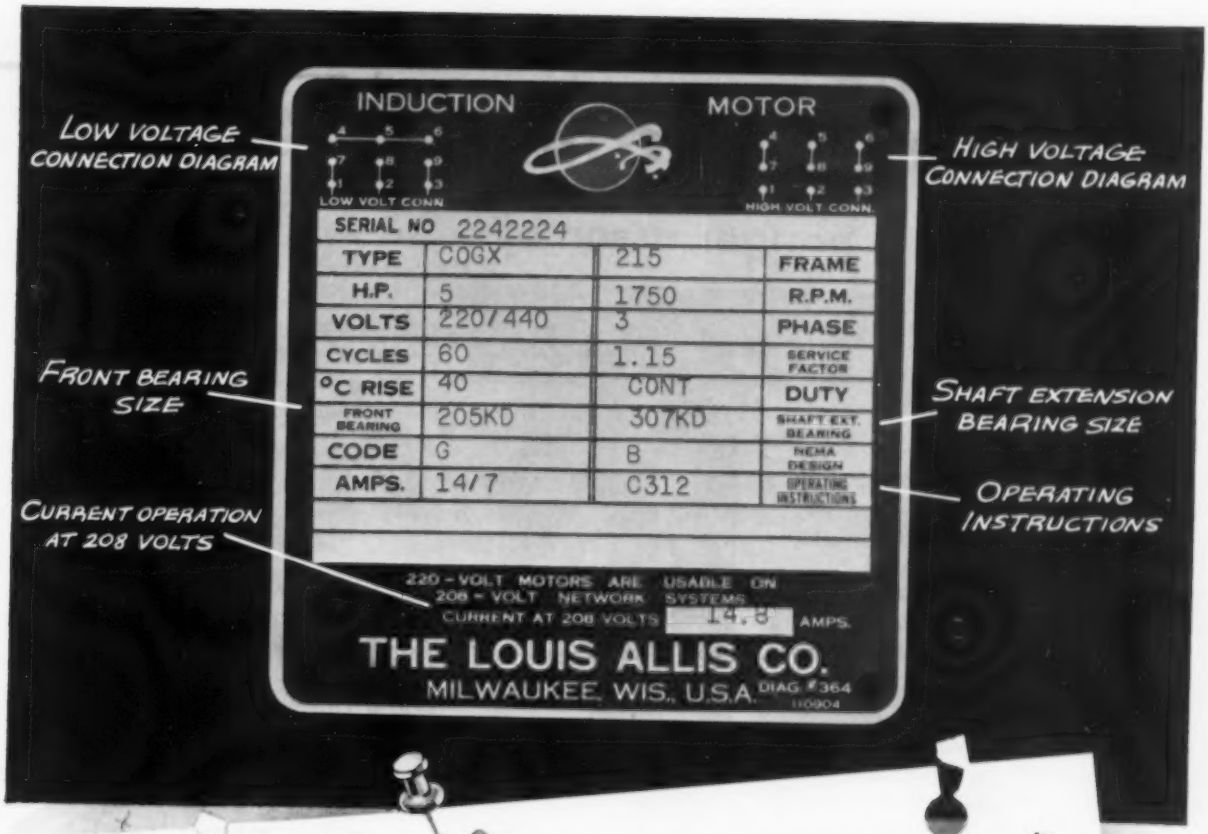
▸ *YORK CORP.*—Joseph J. Sullivan, sales manager for room air conditioning.

▸ *EUREKA WILLIAMS CO.*—Sterling Mitchell, advertising manager.

▸ *DRAYER-HANSON, INC.*—A. A. Gonzales, general supervisor of sales order department.

▸ *SEELYE STEVENSON VALUE & KNECHT*—John P. H. Perry, consultant.

▸ *GENERAL CONTROLS CO.*—Maurice Eastin, sales manager for the Perfex Div.


LOW VOLTAGE CONNECTION DIAGRAM
INDUCTION MOTOR
LOW VOLT CONN.
HIGH VOLT CONN.
HIGH VOLTAGE CONNECTION DIAGRAM
SERIAL NO 2242224
TYPE COGX 215 FRAME
H.P. 5 1750 R.P.M.
VOLTS 220/440 3 PHASE
CYCLES 60 1.15 SERVICE FACTOR
°C RISE 40 CONT DUTY
FRONT BEARING 205KD 307KD SHAFT EXT. BEARING
CODE G B NEMA DESIGN
AMPS. 14/7 C312 OPERATING INSTRUCTIONS
FRONT BEARING SIZE
SHAFT EXTENSION BEARING SIZE
OPERATING INSTRUCTIONS
CURRENT OPERATION AT 208 VOLTS
220 - VOLT MOTORS ARE USABLE ON 208 - VOLT NETWORK SYSTEMS
CURRENT AT 208 VOLTS 14.8 AMPS.
THE LOUIS ALLIS CO.
MILWAUKEE, WIS., U.S.A.
DIAG. #364
110904

why is this nameplate important to you?

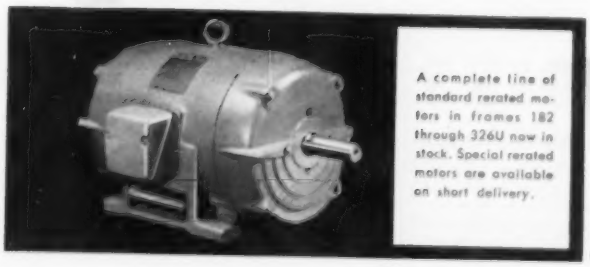
It provides visible evidence that Louis Allis standard motors are built with special care to run better, last longer . . .

Look at the information on this nameplate—information that makes life a lot easier for the user. And to keep this information available at all times, we make this nameplate out of corrosion-resistant stainless steel.

Yes, in the new LA line of standard motors, even the nameplate gets special attention from our engineers. And here's what it means to you:

- The rerated frame size shown means more horsepower from motors with smaller outside dimensions. Performance has been improved by new materials and manufacturing methods.
- Spare bearings can be easily ordered from bearing size and type designations on nameplate, thus eliminating disassembly of motor to determine bearing size. Bearings used are conservatively rated for long life.
- No more lost connection diagram since this information is simply and clearly shown on nameplate. This combined with permanent lead markings, assures that correct motor connections can always be made.
- 220/440 volt motors are suitable for operation on 208 volt systems and full load current for 208 volt operation is included on the nameplate. This eliminates need for original equipment manufacturers to carry a stock of 208 volt motors.

Because they are built with special care, new LA standard motors can do a lot more for you. New bulletin No. 1700 shows you why—just write for your copy.



A complete line of standard rerated motors in frames 182 through 326U now in stock. Special rerated motors are available on short delivery.

LA-106

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

you save engineering time

with complete hanger assemblies

To save many hours of engineering time and to speed up your specifications, use Blaw-Knox overhead roller assemblies, rigid hanger assemblies, functional spring hangers with the patented *internal swivel action*, constant support spring hangers and vibration eliminators.

Each is a complete unit, designed for a specific purpose. Constructed to comply with the "code for pressure piping." Available in types and sizes to meet varying conditions.

And each is ready to install, which eliminates expensive cutting, threading and assembling in the field.

Our experienced engineers are available to both design and make recommendations for your hanger requirements.

Write for your copy of Bulletin No. 54 to get complete information

BLAW-KNOX COMPANY
Power Piping and Sprinkler Division
Pittsburgh 33, Pennsylvania

BLAW-KNOX **PIPE HANGERS**

Complete line of functional spring hangers • constant support spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated piping systems for all pressures and temperatures

WHO'S WHAT

Continued

▸ *EMERSON RADIO AND PHONOGRAPH CORP.*—George Forman, advertising manager.

▸ *METAL & THERMIT CORP.*—Charles M. Dick, Jr., director of "Kel-Ray" sales force.

▸ *GENERAL ELECTRIC CO.*—George K. Marshall, manager-product planning for the Weathertron Dept.

▸ *NIAGARA MACHINE & TOOL WORKS*—Ransom B. De Lisle, purchasing agent.

▸ *CARRIER CORP.*—Howard J. Berkel, director of personnel for Bryant Div.

▸ *TRION, INC.*—William W. Nuernberg, treasurer.

IN THE TERRITORIES . . .

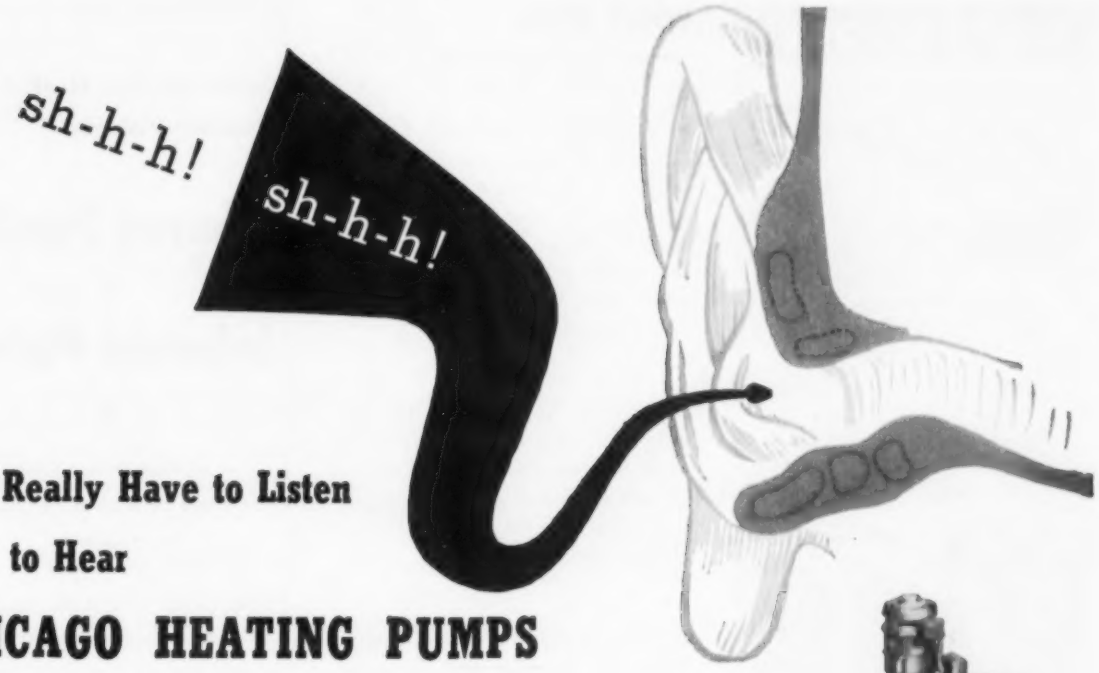
(Recent sales appointments)

▸ *YORK CORP.*—H. Schultz & Sons, Inc., room air conditioner distributor in Newark area.

▸ *AMERICAN BLOWER CORP.*—New district office managers are: J. R. Hopkins, Youngstown; O. J. DuPree, Wichita; W. F. Markey, San Antonio; J. B. Clayton, Evansville; B. G. Kemp, Nashville.

▸ *OLIN MATHIESON CHEMICAL CORP.*—Joseph F. Calvey, assistant district manager, Ramset Fastening System, New York; Walfrid H. Johnson and Arthur W. Bailey, sales representatives for metals division field force. New York headquarters for Ramset Fastening Corp. has been moved to 132 Nassau St.

▸ *ARMSTRONG FURNACE CO.*—G. M. Mahensmith, district manager for Indiana, Kentucky, Illinois territory; Ed Clifford to cover Michigan, part of Ohio.



You Really Have to Listen to Hear CHICAGO HEATING PUMPS

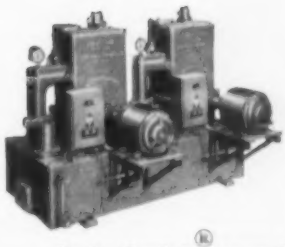
Quality Makes Them Quiet

In a heating pump, silence—or near silence is golden. It tells you, first of all, that here is a precision-made pump that will "pay off" through years of service . . . with least maintenance and continuous high performance. And quiet operation of a heating pump means quieter operation of the entire heating system.

A Size for Every Job

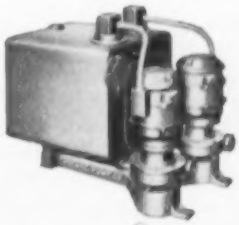
There are Chicago Heating Pumps for every type of heating job. This means you can get a Chicago Pump that exactly fits your requirements — in capacity, pressure, and equivalent direction radiation ratings. You don't have to accept a substitute that may labor at heavy loads and then need excessive maintenance to keep it in service. Specify Chicago Pumps and be sure of quiet, efficient pumping — always. Write to Department C for descriptive literature.

Type AVC condensation pump & receiver for 5,000 to 10,000 EDR and 10 to 30 psi. Write for Bulletin 245.

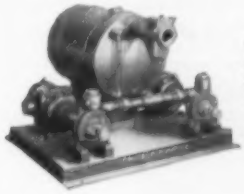


Duplex Condo-Vac® return line vacuum and boiler feed pump for vacuum systems at pressures to 40 psi, 2,500 to 150,000 EDR. Described in Bulletin 270.

Type CLLI vertical condensation pump & receiver for low returns. 1,000 to 40,000 EDR and 10 to 52 psi. Bulletin 255.



Sure Return® condensation pump and receiver. Will not steam bind. For low and medium pressure systems to 75,000 EDR. Described in Bulletin 250.



Duplex FC condensation unit for capacities up to 50,000 EDR and 150 psi. Described in Bulletin 260.

fmc

CHICAGO PUMP COMPANY

Subsidiary of Food Machinery and Chemical Corporation

BUILDING PUMP DIVISION

400 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems • Flush Kleen ® Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every industrial use

LIMITORQUE®

VALVE CONTROLS

push-button operation

Here's a completely automatic, dependable, low cost valve operator for small valves. Size-for-size, the types SMA-00 and SMA-000 Limitorque Valve Operators are designed for greater valve stem capacity; will produce more stem torque, and withstand greater thrust than any other operator on the market. They are readily adoptable to all types of valves—gate, plug, globe and butterfly; and they have many of the exclusive features which have made the larger Limitorque Operators the most widely used in the world.

Send for Catalog L-550 and see why this and other types of Limitorque Valve Operators are so widely used.

PHILADELPHIA GEAR WORKS
INCORPORATED
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA
BALTIMORE • CLEVELAND
Limitorque Corporation · Philadelphia
Industrial Gears & Speed Reducers · Limitorque Valve Controls
Established 1892

WHO'S WHAT

Continued

▸ *GENERAL CONTROLS CO.*—B. L. Lerch, Midwest regional manager; Norbert A. Grainer, manager of Chicago branch, succeeding Mr. Lerch; Jack Croushore, supervisor of division activities of Chicago regional office; Ray Wheeler, head of Columbus, Ohio office.

▸ *GEORGE A. HEATH*—The central Pennsylvania manufacturers' agent has introduced D. R. Crowley, Jr. into his business and is changing the name of the organization to Heath-Crowley, Inc.

▸ *TENNEY ENGINEERING, INC.*—Foster N. Reynolds and Associates, representative for Florida, Georgia, Alabama, Tennessee, the Carolinas.

▸ *PHILCO CORP.*—Harold R. Sheer, division sales manager of new metropolitan division, to cover New York City, Newark, Trenton, Philadelphia areas; A. H. Chatten, North Atlantic division sales manager; Robert C. Digges, Atlantic division manager; Stuart A. Falk, general manager of Philco Distributors, Inc., Cleveland; Joseph F. Anlauf, east central division sales manager.

▸ *PATROL VALVE CO.*—New representatives and territories they will cover are: Thomas Associates, Buffalo-Erie; Richard Dirkes, western Missouri, northwestern Kansas; Tom Carmon, southern Kansas, Oklahoma; Thomas Harper, greater Philadelphia.

▸ *RICHMOND RADIATOR CO.*—M. H. Cox, representative for Texas, most of Louisiana; John W. Shea, New England sales manager.

◂ *CONOFLOW CORP.*—Ernest L. Graves, sales representative for Oklahoma.

Send for This Useful Reprint Volume

"Correct Practice in Industrial Piping"

— All-New Second Edition —
196 Pages — 8½" x 11" — $1.50

This practical book is made up of outstanding papers and data on industrial piping selected from past issues of "Heating, Piping & Air Conditioning." It is a most comprehensive collection of case studies, showing how various difficult piping problems encountered in different industrial plants were successfully worked out by piping experts.

Design, installation, operation, and maintenance . . . steam, air, gas, oil, process, water and refrigeration piping . . . piping in pulp and paper and steel mills, in automobile plants and breweries, in the food and chemical and textile industries, and in many other types of manufacturing plants are dealt with from many different angles.

Send $1.50 today for this book to the address below.

KEENEY Publishing Company

6 North Michigan Ave., Chicago 2, Ill.

"I shot an arrow into the air,
It fell to earth, I know not where."

The Arrow and the Song—Longfellow, 1845

Longfellow a space buyer?

Longfellow's lament could well have been applied to advertising back in 1845. Yes, even up to 1914 when a group of advertisers, agencies and publishers, alarmed by the waste and guesswork in their business, brought order out of advertising chaos by organizing the Audit Bureau of Circulations. These pioneers in circulation auditing established a definition for paid circulation, rules and standards for measuring circulation, methods for auditing and reporting the FACTS.

For value-minded advertisers the era of blind space buying ended in 1914. ☆ ☆ Today's experienced space buyers use the audited information in A.B.C. reports to aid them in applying media to markets and get full value for advertising dollars. Here are some of the FACTS in A.B.C. reports that provide a sound basis for advertising investments: • How much paid circulation • How much unpaid distribution • Occupational or business breakdown of subscribers • Where they are located • How much subscribers pay • Whether or not premiums are used • How many subscribers in arrears • What percentage of subscribers renew. ☆ ☆ Sales messages go direct to their targets, there's no shooting "into the air" when space buyers base their decisions on A.B.C. FACTS. This publication is a member of the Audit Bureau of Circulations because we want our advertisers to know what they get for their money when they use space in these pages. Ask for a copy of our A.B.C. report and then study it.

SEND THE RIGHT MESSAGE TO THE RIGHT PEOPLE

Paid subscriptions and renewals, as defined by A.B.C. standards, indicate an audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.

A.B.C. REPORTS—FACTS AS A BASIC MEASURE OF ADVERTISING VALUE

Specify Raypak

Copper tube forced hot water boilers

...with exclusive gas modulation —sizes the boiler for the job!

Approved by A.G.A.

Complies with A.S.M.E. code

12 Models fit every need

Check these features

Raypak boilers are specifically packaged for Radiant Panel, Baseboard, Radiator, Convector, Swimming Pool and Volume Hot Water Supply Systems and also are ideal companions to Air Conditioning Units.

1. Original "Plug-in" Boiler
2. 100% copper waterways last a lifetime
3. Triple the BTU's per pound of weight
4. Remarkably compact and durable
5. Laboratory tested at 2,000 psi—no failure

Raypak's skilled and specialized distributors and representatives are available any time for consultation on any wet heating problem.

Raypak

RAYPAK COMPANY, INC.
Engineers-Manufacturers
2416 Chico Avenue
El Monte, California Dept. H-2

Please send me additional information and name of local representative.

Name_____

Occupation_____

Company_____

Address_____

City_____ State_____

WHO'S WHAT *Continued*

▸ *JOHNSON SERVICE CO.*—Newark branch office relocated to Union, N. J. Charles E. Nelson is branch manager.

▸ *CLEAVER-BROOKS CO.*—Erickson Industrial Products Co., representative for Dallas marketing area.

▸ *SERVEL, INC.*—Anslinger Air Conditioning Co., distributor for Corpus Christi, Tex. trading area.

▸ *VIKING AIR PRODUCTS DIV., NATIONAL-U.S. RADIATOR CORP.*—M. E. Kelley, representative for Iowa, surrounding states.

▸ *AUTOMATIC SWITCH CO.*—Vermont Hardware Co., Inc., stocking distributor for solenoid valves in parts of Vermont and New Hampshire; Baker Specialty and Supply Co., Inc., a similar distributorship in Logansport, Ind.

▸ *DRAYER-HANSON, INC.*—Irvin Secord, sales engineer for commercial division at company's home office at Los Angeles.

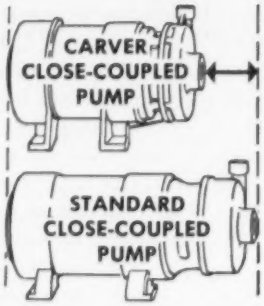
▸ *CLARK CONTROLLER CO.*—Ralph E. Fritzsche and George J. Lawson, district application engineers at Youngstown and New York City, respectively.

▸ *YORK-SHIPLEY, INC.*—R. M. Davies, distributor for north and central Indiana for company's industrial division.

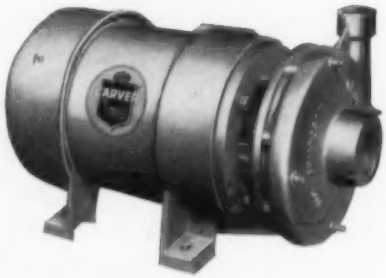
▸ *HEIL CO.*—Adams, Inc., wholesaler for North Dakota, parts of South Dakota and Minnesota.

▸ *KRITZER RADIANT COILS, INC.*—Neviaser & Hoddinott, representative for Washington, D.C. area.

NEW CARVER MODEL B PUMPS are really CLOSE COUPLED



They Save as Much as 20% in Overall Length!



When we say close-coupled we really mean close-coupled. The illustrations dramatically tell the story.

Mounted on the sturdy, short shafts of close-coupled motors these highly efficient Carver Model B Pumps are stronger, quieter in operation, more attractive . . . better in every way for every job.

And extremely important, of course, is the extraordinary compactness which makes them ideal where space is limited.

GUARANTEED PERFORMANCE assures lasting satisfaction.

CARVER also manufactures Frame-Type Pumps, Split-Case Pumps, Submersible Sump Pumps and Self-Priming Pumps.

Ask for Bulletins
CARVER PUMP CO.
1460 Hershey Avenue
Muscatine, Iowa

CARVER

The quality name in pumps

WHO'S WHAT

Continued

▸ *AIRTEMP DIV., CHRYSLER CORP.*—New district managers are: Charles A. McGinnis, Cleveland; Robert T. Welch, Jr., Louisville; Garnet Walter Lunsford, Atlanta; Robert W. Lamb, New York, to work with distributors in northern New Jersey; Thomas B. Sexton, Los Angeles; R. B. Hamilton, Dallas, to direct sales in south and southwest Texas; and John E. Ballew, Dallas, to be in charge of north Texas area. Elmer F. Voss is new field engineer in Atlanta.

▸ *GUSTIN-BACON MFG. CO.*—New sales representatives and their territories: J. A. Fairfield, eastern Wisconsin, northwest Illinois, northeast Iowa; R. E. Van Winkle, Michigan, northern Indiana, northwestern Ohio; C. Barry Neill, Jr., Alabama, western Tennessee, western Georgia.

▸ *IRON FIREMAN MFG. CO.*—Robert L. Bluhm, district sales manager, West Virginia, southeastern Ohio, eastern Kentucky; Edward J. Dwyer, industrial sales representative for Vermont, upstate New York excepting Buffalo; Philbert J. Schumacher, district sales manager, Philadelphia.

▸ *A. W. CASH CO.*—J. W. Cherry Co., agent for automatic valves, controllers, governors and temperature regulators in northwest Louisiana, south Arkansas, northeast Texas.

▸ *CONOFLOW CORP.*—Harry J. Hartz, manager of expanded Philadelphia office. He will be assisted by William E. Hagan as district sales engineer.

▸ *SURFACE COMBUSTION CORP.*—Comer F. Hampton, air conditioning sales engineer for F. J. Evans Engineering Co., Surface Combustion's southern representative. He will cover the southeastern territory.

▸ *BELL & GOSSETT CO.*—Squire-Cogswell Co., representative in Chicago area for oil-less air compressors and paint spray outfits.

▸ *PITTSBURGH CORNING CORP.*—Harry S. Baut, district manager, Philadelphia office.

▸ *MORRIS MACHINE WORKS*—Cross Pump & Equipment Co., sales representative for southern West Virginia, eastern Kentucky, western Virginia.

▸ *AUTOMATIC SWITCH CO.*—J. K. Kalb Co. and Washburn-Garfield Co., authorized stocking distributors of solenoid valves in Corpus Christi, Texas, and Worcester, Mass., respectively.

investigate

Van-Cor

PIPE, FITTINGS, VALVES

Van-Cor is an unplasticized polyvinyl chloride that resists the corrosive action of hundreds of industrial acids and alkalis as well as sewage waste and brine. Van-Cor piping costs less, is lighter in weight, and easier to install than conventional pipe. It is readily formed, machined, threaded and welded. On many installations where metallic piping was eaten up *in a few months,* Van-Cor pipe has served *for years without deterioration.* Thus it quickly returns its cost and pays handsome dividends.

Van-Cor sheets are also fabricated into ducts, hoods, chemical tanks, fumestacks, etc.

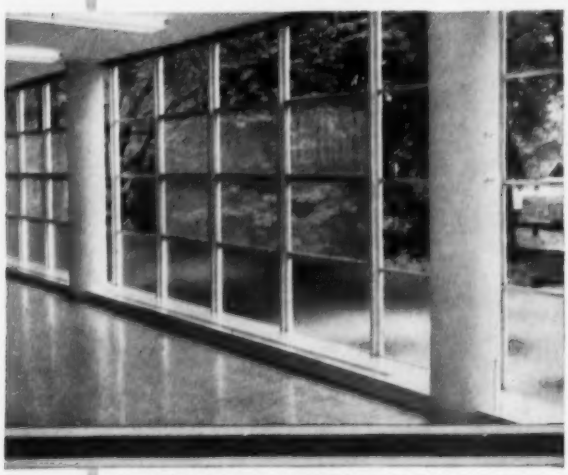
INVESTIGATE!

Write for Bulletin, Specifications and Name of Nearest Distributor.

INDUSTRIAL DIVISION OF
COLONIAL PLASTICS MFG. CO.

SUBSIDIARY OF THE VAN DORN IRON WORKS CO.
2685 EAST 79th STREET • CLEVELAND 4, OHIO

Blend It...
Hide It...
Combine It...



Installed as a continuous strip in window head or sill (as above), AGITAIR STRIPLINE is the only practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill.

AGITAIR®

STRIPLINE

DIFFUSERS

BLEND IT . . . specify AGITAIR STRIPLINE as a continuous decorative unit, or in sections to meet any requirements of interior treatment.

HIDE IT . . . in shallow lighting coves for perfect concealment.

COMBINE IT . . . with unit or continuous lighting fixtures.

AND REMEMBER . . . no matter how you use it — AGITAIR STRIPLINE diffusing vanes create maximum mixing and aspiration . . . quick temperature equalization . . . and correct air distribution over any desired length.

Every Inch a Diffuser . . . the Vanes Make the Difference

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

WHO'S WHAT

Continued

▸ *AMANA REFRIGERATION, INC.*—Alan H. Jobson, Jr., dealer development manager of northeastern region; Graybar Electric Co., Inc., distributor for Detroit area; Major Appliance Co., southwest Michigan representative; G. M. Popkey Co., Inc., expanding its coverage to include the Iron Mountain district in Michigan.

▸ *BUSH MFG. CO.* and *HEAT-X, INC.*—Herb Bolhouse, sales engineer for western Michigan area.

▸ *SERVEL, INC.*—Beaullieu Air Conditioning & Heating Co., Lafayette, La. and Mechanical Equipment Co., Mobile, distributors of air conditioning products in their respective areas.

▸ *ROBERT MFG. CO.*—A. S. Pugh, charge of new factory branch at Hackensack, N. J. to serve New York, New Jersey, Delaware, Maryland, Pennsylvania, New England.

▸ *THOMSON ELECTRIC WELDER CO.*—R. B. Strout, head of Chicago office.

▸ *DELCO APPLIANCE DIV., GENERAL MOTORS CORP.*—Norman J. E. O'Brien, manager of Detroit sales region comprising Michigan, Indiana, Kentucky, parts of Ohio, West Virginia.

▸ *PARKER APPLIANCE CO.*—Louis H. Hein Co., distributor for tube and hose fittings, tube working tools in greater New York.

▸ *FEDDERS-QUIGAN CORP.*—G. Worthington Hipple, eastern regional manager.

▸ *INLAND STEEL PRODUCTS CO.*—Roy C. Tunelius, representative for northen Indiana, southwestern Michigan.

▸ *DUNKIRK RADIATOR CORP.*—Jerry Fields, representative for Connecticut.

▸ *MULTI-VENT DIV., PYLE-NATIONAL CO.*—Edwin J. Kurek, north central regional manager.

▸ *CARRIER CORP.*—Richard K. Chapman, branch manager of Detroit office for Unitary Equipment Div.

▸ *DOLLINGER CORP.*—Malcolm W. Black & Co.,

WHO'S WHAT

Continued

Inc., sales representative for New York City, northern New Jersey, and Westchester county areas.

▸ *THERMO-PRODUCTS, INC.*—Jim K. Schaeffer, Chicago area district manager.

▸ *AIRTEMP DIV., CHRYSLER CORP.*—L.D. Brosell, West Coast assistant regional manager.

▸ *TORIT MFG. CO.*—Frank K. Donnelly, sales representative for Washington, Oregon trading area.

▸ *TRANE CO.*—William L. Mullins, appointed to Oklahoma City sales office.

▸ *YORK CORP.*—H. Schultz & Son, Inc., distributor of room air conditioners in northern New Jersey.

▸ *McQUAY, INC.*—William P. Remmel, heating, air conditioning representative for Milwaukee.

▸ *AEROQUIP CORP.*—Clyde Stratton, manager of new warehouse at Dallas to serve south and southwest area. ⧺

NOW is the time to consider

SNOW MELTING

Systems around Buildings and Grounds

Better send at once for our SNOW MELTING MANUAL. Here are design data based on a study of—and others' actual experience with over 100 snow melting systems of all kinds for

- LOADING PLATFORMS and DOCKS
- SIDEWALKS • ROADS • DRIVEWAYS
- MARQUEES • PARKING AREAS
- RUNWAYS • RAILWAY SWITCHES

and other applications which HAVE proved that this modern method of snow removal

Costs No More Than Other Methods

—and because snow melting by pipe coils has other distinct advantages, such as dirt-free sidewalks and entrances, and the complete elimination of ice surfaces, the demand for this method of snow removal is swiftly growing.

Complete information on the correct design, installation and operation of snow melting systems is offered in the new SNOW MELTING MANUAL, a reprint of articles originally published in HEATING, PIPING & AIR CONDITIONING.

Fifty cents will bring you this SNOW MELTING MANUAL . . . a valuable addition to your file on business opportunities.

Heating, Piping & Air Conditioning

6 North Michigan Avenue Chicago 2, Illinois

Quickdraft

22 INCH MODEL SHOWN

CURES NATURAL DRAFT TROUBLES

Increasing concentration of carbon and sulphur dioxides in the atmosphere, recently reported by scientists, handicaps ordinary chimneys by decreasing natural draft (CO_2 is 55% and SO_2 is 225% heavier than air) . . . and by demanding more draft because additional air is required to provide sufficient oxygen. In addition, current trends constantly demand more draft . . . (1) new fuels that require more oxygen . . . (2) longer flue travel in furnaces and boilers. As a result, more and more heating plants operate at low efficiency because of gravity draft troubles.

WITH POWER DRAFT THAT ASSURES HEATING PLANT EFFICIENCY

. . . No Fans or Motors in Smoke Line

Quickdraft power draft stops sooting, eliminates chattering, drys wet chimneys and greatly increases combustion efficiency. It does not obstruct smoke line with fans or motors. Quickdraft assures top performance from old and new heating plants. All models are approved by Board of Standards and Appeals, New York City. Write today for details.

Residential models for smoke outlet diameters 6, 7, 8, 9 and 10 inches.

M-286-QD

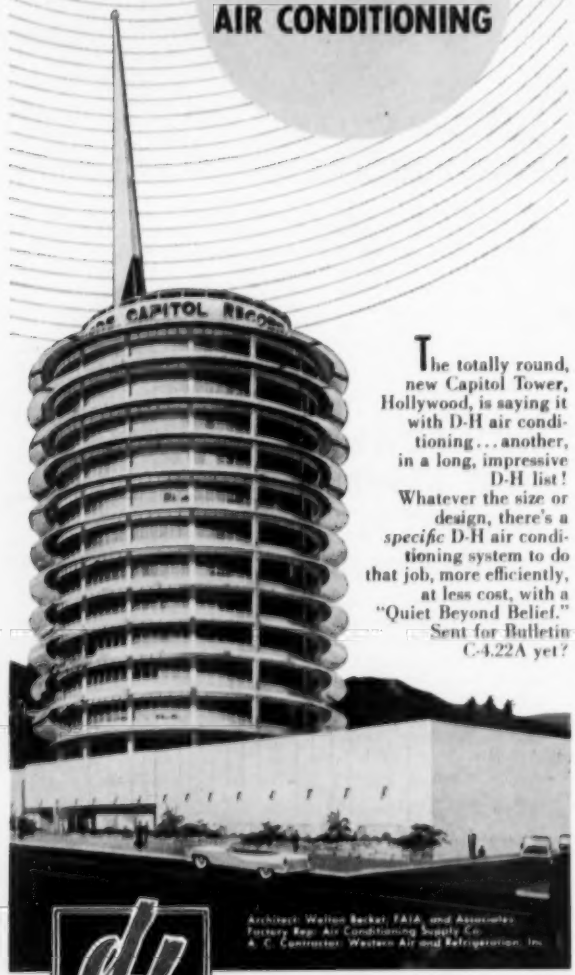
Quickdraft COMPANY
Canton 1, Ohio

QUICKDRAFT COMPANY
Dueber-Hampden Building
P. O. Box 87-K
Canton 1, Ohio

Capitol
RECORDS

..going 'round in the best air conditioning circles

drayer-hanson
•
AIR CONDITIONING



The totally round, new Capitol Tower, Hollywood, is saying it with D-H air conditioning... another, in a long, impressive D-H list! Whatever the size or design, there's a *specific* D-H air conditioning system to do that job, more efficiently, at less cost, with a "Quiet Beyond Belief." Sent for Bulletin C-4.22A yet?

Architect: Welton Becket, FAIA, and Associates
Factory Rep: Air Conditioning Supply Co.
A. C. Contractor: Western Air and Refrigeration, Inc.

d-h SINCE 1918
drayer-hanson
INCORPORATED

3301 Medford Street • Los Angeles 63, California
(Subsidiary of National - U.S. Radiator Corporation)

WE HEAR THAT...

▸ The facts that engineering and research facilities and personnel have been doubled since the merger of *NATIONAL-U. S. RADIATOR CORP.* last April, and that additional engineers are still needed by the company, were brought out at a meeting at Johnstown, Pa. last month.

Under the company's educational program engineering scholarships are provided for two high school graduates in each of the areas where plants are located. Students on these scholarships work during summer vacations in the plants. The program was initiated several years ago by *T. B. FOCKE*, president.

The engineering and research department was formulated for the planning for, investigation of, and consideration of the products to be sold with the long range viewpoint.

Some of the reported benefits of the merger are elimination of duplicate effort in engineering, consolidation of sales offices and sales forces, improvement in manufacturing efficiency through plant consolidation and the elimination of many duplications in administration.

There are eight sales divisions operating under the general sales department, with the heating and air conditioning being the largest — accounting for over 60 percent of the corporation's total sales volume.

Prior to the merger, National's manufacturing division had six operating units and U. S. Radiator, nine plants. Consolidation of the facilities has reduced the total operating units to 11.

▸ *TITUS MFG. CORP.* and *TITUS, INC.* have merged as of December 30, 1955. The new firm will bear the name of Titus Mfg. Corp. Operations of the new company will be directed by *D. L. TITUS*, president; *R. W. TITUS*, vice president; and *J. S. SMITH*, vice president in charge of sales.

▸ *WALWORTH CO.* has completed purchase of all of the outstanding common stock of the *CONOFLOW CORP.* Conoflow will be operated as an independent subsidiary without change in management, employees or present policy.

▸ *H. K. PORTER CO., INC.* has changed the name of its fittings division from Watson-Stillman to W-S Fittings Division. The division's trademark, two diamonds separated by the letters "W-S", will be retained.

▸ *ROCKWELL MANUFACTURING CO.* is adding three new plants to meet higher production requirements. Two new 100,000 sq ft plants have gone into construction in recent months. The company is negotiating for purchase of a third facility.

WE HEAR THAT

Continued

▸ *KAISER ALUMINUM & CHEMICAL CORP.* has announced a $280,000,000 expansion program that will bring the company's total primary aluminum capacity up to 654,000 tons per year. Major projects under the program will be construction of a 220,000 ton aluminum reduction plant at Ravenswood, W.Va. and a 500,000 ton alumina plant near Gramercy, La. It is planned to break ground for these facilities by April.

▸ *NU-WAY CORP.* has completed a new plant that will provide a 40 percent increase in floor space. Located at Milan, Ill., the building was erected and equipped at a cost in excess of $100,000. One-half of the addition will house manufacturing operations. The other will be devoted to warehouse space.

▸ *GAINES-COLLINS* is dropping the name "Quijada" from its automatic pipe threading machines and cutters. Also, the company is planning to build a $250,000 plant in El Monte, Calif. in the Spring.

▸ Foundations have been laid for a new 65,000 sq ft facility for the *FRANKLIN C. WOLFE CO.* The structure will centralize all sales and business units of the company in one location. In addition to the $250,000 plant expansion, approximately $100,000 will be invested in new machinery and equipment.

▸ The addition to the Buffalo plant of *JOSEPH T. RYERSON & SON, INC.*, which will increase by almost 50,000 sq ft the former plant and office space, is about 75 percent completed. Also, the company has entered into an agreement to purchase the property and inventory of the Wallingford, Conn. plant of *FOLLANSBEE METALS CORP.*

▸ *GRINNELL CO., INC.* has expanded production with a recently completed pipe shop and distributing warehouse addition at Philadelphia. The one story addition increases operating space by 50 percent, adding 19,250 sq ft. Work was reported to have cost $206,000.

▸ The "Port-A-Pony" portable power drive has been acquired by *TOLEDO PIPE THREADING MACHINE CO.* The *THREAD-EZY CO.*, a subsidiary, will continue to manufacture the unit with distribution handled through Toledo's distributor organization.

▸ *BORG-WARNER CORP.* has entered into an agreement for the acquisition of *PRIMOR PRODUCTS, INC.* Primor is to be operated as a Borg-Warner divi-

NOW! ...for combined heating-cooling systems

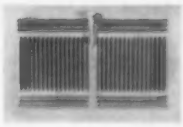
...custom comfort for every room

CEILING AIR DIFFUSERS

Flush or extended models; also dampers and installation rings

NO. 551 PERIMETER WALL REGISTERS

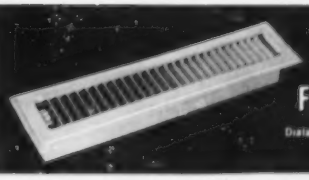
Fractionator volume control; complete 360° air diffusion.



NEW!

B-24 PERIMETER BASEBOARD DIFFUSERS

Adjustamatic finger tip damper control; built-in damper.



PH SERIES PERIMETER FLOOR REGISTERS

Dialamatic control; set screw for easy balancing

...with this complete line of Standard Stamping Registers!

These four Standard Stamping Registers enable you to select the air pattern best suited to the size, shape, and use of every room served by a combined heating-cooling system. They're easier to install, trouble free, and give every two-way system perfect air distribution without blasts, hot spots or cold corners! Get the facts about them now!

MAIL THE COUPON NOW FOR FREE LITERATURE!

STANDARD Stamping & Perforating Company
3125 W. 49th Place, Chicago 32, Illinois

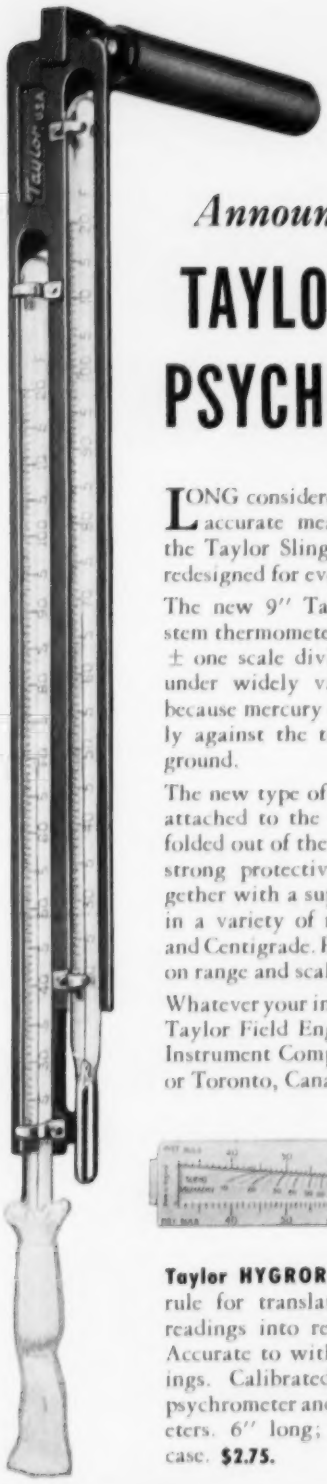
Gentlemen: Please send me your Registers and Grilles Catalog.

Name_____

Company_____

Address_____

City_____ Zone____ State_____



Announcing a new

TAYLOR SLING PSYCHROMETER

LONG considered the basic standard for accurate measurement of humidity, the Taylor Sling Psychrometer has been redesigned for even simpler operation.

The new 9" Taylor Gold Back etched stem thermometers are accurate to within ± one scale division. They can be read under widely varying light conditions because mercury columns stand out clearly against the translucent golden background.

The new type of swivel handle is rigidly attached to the metal back, and can be folded out of the way when not in use. A strong protective case is provided, together with a supply of wicks. Available in a variety of ranges, both Fahrenheit and Centigrade. Price **$10** to **$15** depending on range and scale calibration.

Whatever your instrument needs, call your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N.Y., or Toronto, Canada.

Taylor HYGRORULE. A convenient slide rule for translating wet and dry bulb readings into relative humidity values. Accurate to within ± 1% of table readings. Calibrated both sides for sling psychrometer and wall mounting hygrometers. 6" long; genuine leather pocket case. **$2.75.**

Taylor Instruments
MEAN ACCURACY FIRST

WE HEAR THAT

Continued

sion. The parent company's first action after the consummation of the transaction will be to expand the manufacturing space of the Primor plant located at Adrian, Mich.

▸ *AIRTEMP DIV., CHRYSLER CORP.* plans to produce in excess of 100,000 room air conditioners for 1956. That figure will be a new high for Airtemp, says the company.

▸ *WARREN WEBSTER* has returned to the office of president of the company bearing his name. That office has been vacant for the past two years during Mr. Webster's absence in Washington, where he has been serving as Director of Procurement and Production Policies in the office of the Assistant Secretary of Defense for Supply and Logistics.

▸ *OSTER MFG. CO.* has completed the move to its new plant in Wickliffe, Ohio, a Cleveland suburb. The unit has a total area of 105,000 sq ft. The new plant will provide single location facilities for production of the company's expanded line of equipment.

▸ *GENERAL CONTROLS CO.* announces new and larger facilities for its Kansas City district office. The move is predicated on increased service to customers in the local area, Omaha and Wichita branch office territories, and to several counties in Kansas and Missouri.

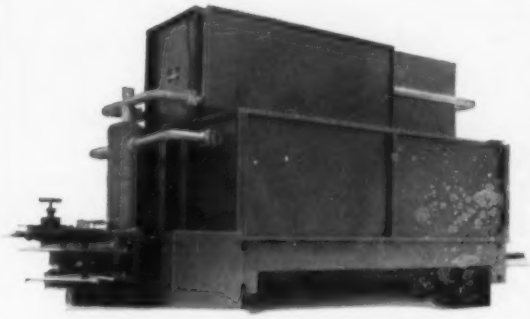
▸ *REVCOR CO.* is embarking on an expansion program designed to double its present production facilities. The company's recently built plant at Carpenterville, Ill. will be enlarged to provide for increased production program.

▸ *VORTOX CO.* has been elected to membership in the *AIR FILTER INSTITUTE*. This brings the total of manufacturer members in that organization to 14.

▸ *SUPERIOR VALVE & FITTINGS CO.* has established new warehousing facilities at Bergenfield, N.J. The addition marks the company's entry into the warehousing field on the East Coast.

▸ Nearly 150 representatives from *CARRIER CORP.'s* Machinery and Systems Div. sales offices across the nation gathered at the firm's home office at Syracuse recently for a three day general sales meeting.

▸ *CORY CORP.* has broken ground for a new executive office in Chicago. Estimated cost of the one story building is about $500,000. It will include 28,000



NIAGARA SECTIONAL *Aeropass* CONDENSER

gives you lower cost refrigeration, saves you **LABOR,** *Power, Water*

- **Because Niagara "Duopass" pre-cooling removes super-heat and gas condenses at lower temperature.**
- **Because the system is automatically purged of oil.**
- **Because the new design improves the heat transfer to the out-door air by evaporation.**
- **Because these features keep the condenser working for long life with "new plant" efficiency... always full capacity.**
- **Because you save 95% of cooling water cost.**

You save labor in upkeep. With full access to all parts and interior piping you see everything in easy inspections. You head off dirt accumulation and corrosion. Casing panels are removable without moving the coils. The coils can be cleaned from both sides.

First cost is low; freight is low because of the lowest space/weight ratio; you save much labor in erection. Capacity range is 90 to 240 tons. No other condensing method gives you so much saving in money and trouble.

Write for Niagara Bulletin 131.

NIAGARA BLOWER COMPANY

Dept. HP, 405 Lexington Avenue
NEW YORK 17, N. Y.

District Engineers in Principal Cities

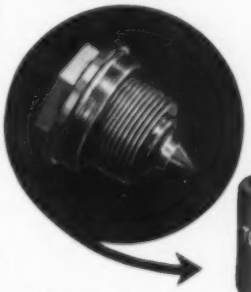
NIAGARA — *Over 40 Years' Service in Industrial Air Engineering*

Insist on...

Sterlco® FLOAT and THERMOSTATIC TRAPS

they perform **BETTER** *because there's a* **BIG DIFFERENCE!**

For example, look at the bellows ... it is precision formed under pressures many times higher than ever encountered in service; it adjusts *itself* instantly to varying pressures or temperatures ... always conserves steam. If bellows is damaged, spring action closes valve; equipment becomes cold and easy to locate.



This is the popular ¾" 698, only one in the complete line of Sterlco Float and Thermostatic Traps. Other models range from 1" to 2" for low pressures, and from ¾" to 1¼" for high pressures.

Easily Serviced

Only 4 screws to remove to inspect any Sterlco trap ... complete inspection WITHOUT disturbing pipe connections. Larger models have clean-out plugs. Replacement parts require no shimming or adjustment.

Ideal for UNIT *heaters*

Sterlco Float and Thermostatic Traps are ideally suited for original installation or modernization of existing unit heaters. Their dependability, compactness, large capacity, easy serviceability, and rugged construction make Sterlco traps the outstanding performers on all steam heating equipment.

STEAM HEATING IS MODERN, EFFICIENT, and DEPENDABLE
Sterlco Products Distributed through
LEADING HEATING and PLUMBING WHOLESALERS

FREE — "What You Should Know About Modern Steam Heating". Send for your copy.

STERLING, INC.

3733 N. Holton St., Milwaukee 12, Wisconsin

CONDENSATION AND VACUUM PUMPS

HEATING SPECIALTIES

TEMPERATURE CONTROLS

WE HEAR THAT

Continued

sq ft of floor space. Completion is planned for early Spring.

▸ The addition of an organic fluorine chemicals plant at Calvert City, Ky. will inaugurate *PENNSYLVANIA SALT MFG. CO.'s* expansion program. With construction scheduled to begin at once, the unit will become a component of Pennsalt's chlorine-fluorine production facilities on the Tennessee River.

▸ *SCHAUL MFG. CO.* has acquired a three story building at Cleveland as part of its planned expansion program. The building consolidates all manufacturing, packaging and warehousing facilities and the general offices in one location.

▸ *TRANE CO.* plans to build a new engineering building this year. The structure, with 65,000 sq ft of floor space, will be "L" shaped and will house the company's product and design engineering departments, and allied facilities.

▸ *STEWART-WARNER CORP.* has established four four-year engineering scholarships to be awarded to deserving high school graduates of exceptional ability.

▸ *SQUARE D CO.* and *ELECTRIC CONTROLLER MFG. CO.* have formally begun operations as a merged corporation. Square D as the surviving company, will operate Electric Controller as a separate division.

▸ *STERN, BRENNER & AREY ENTERPRISES, INC.* has been selected by *MATHES COMPANY* as an associate manufacturer of Mathes' commercial units in the Washington area. Also, *HERSHEY MOTOR-STOKER, INC.* has been named as an associate manufacturer and service department operator for air conditioning equipment in the Lancaster and Manheim, Pa. area.

▸ *RHEEM MANUFACTURING CO.* plans to merge with *RICHMOND RADIATOR CO.* Meetings of stockholders of both companies will be called for final ratification.

▸ A new section of the *AMERICAN WELDING SOCIETY* has been formed in Shreveport, La., to bring the total of active sections to 78.

▸ The patent litigation instituted by *CARRIER CORP.* against *YORK CORP.* and a customer of York has been settled amicably to the satisfaction of both parties. The suit against York was for infringement of a patent fundamental belonging to Carrier.

New compactness in air-cooled AIR CONDITIONER design!

Smallest air-cooled, self-contained 5-ton central type unit made.

5 natural wood-grain finishes available on all free-standing models.

Completely automatic, thermostat controlled, air-cooled condenser. (Water-cooled available on 5-ton).

MODEL RO-575W
(with air distribution head)

MODEL NO.	NOMINAL CAPACITY	TOTAL COOL. B.T.U.	COOLING C.F.M.	OUTSIDE DIM.
FL-2	2 Ton	24,000	900 @ .3 S.P.	30Wx21Dx43H
RO-26	2 Ton	24,000	1000 @ .3 S.P.	30Wx21Dx34H
RO-31	3 Ton	36,000	1200 @ .2 S.P.	30Wx23Dx38H
RO-31 H P	3 Ton	37,700	1400 @ .3 S.P.	30Wx25Dx40H
RO-525 A	5 Ton	63,500	1800-2400 @ .3 S.P.	40Wx26Dx57H
RO-575 W	5 Ton	69,500	1800-2400 @ .3 S.P.	40Wx26Dx57H

Thermostat has 3 positions: Continuous – Automatic, Fan & Compressor – OFF.

Complete air conditioning for entire home – or equivalent commercial or office area – at the lowest cost in smallest space! GENERAL AIR CONDITIONERS deliver 2, 3 or 5 tons of cooling. All models operate on standard outlet (220 V, single and 3 phase except 2-ton – single phase only).

Attic, roof, outside, or free-standing units

MODEL RO-525A
(without air distribution head)

NATIONWIDE SALES AND SERVICE

Offices and warehouses:
LOS ANGELES • ATLANTA
BOSTON • CHICAGO
CLEVELAND • HOUSTON
KANSAS CITY • MIAMI
NASHVILLE • NEW YORK
PHILADELPHIA
SAN FRANCISCO • SEATTLE
ST. LOUIS • TAMPA

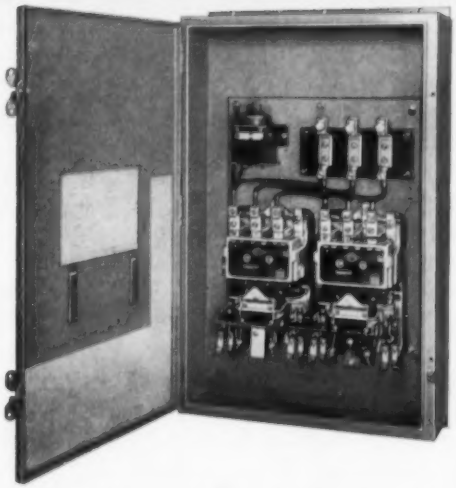
WRITE today for details. Franchise dealerships available.

Main Office
GENERAL AIR CONDITIONING CORP.
Dept. S-20 • 4542 E. Dunham St.
Los Angeles 23, California

FIVE YEAR GUARANTEE — easy payment plan

FURNAS ELECTRIC CONTROLS

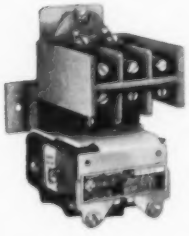
do the best job for AIR CONDITIONING



Objectionable voltage drops eliminated by using a Furnas Electric Increment Starter for Part Winding motor applications. Compare—no expensive auto transformers, no resistors, small size. Increment starting incorporates the advantages of other types of step starting at the lowest cost in the smallest space. Pick the size you need. In-between sizes—a 10, 20*, 30, 40* and 60 hp. size 220 volts.

*Major savings with in-between sizes.

SPECIAL STARTERS AND CONTACTORS



Designed for low cost control of hermetic motors. Two sizes—20 and 30 amps • Dual voltage starter coils • Interchangeable parts • Super Quick Trip Thermal Overload units.

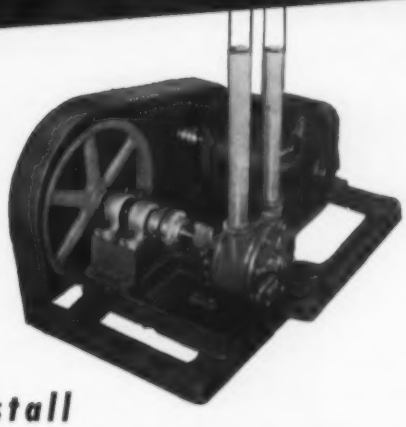
Write for Bulletin #5410 for complete air conditioning control information. Furnas Electric Company, 1041 McKee Street, Batavia, Illinois.

FURNAS ELECTRIC COMPANY

BATAVIA, ILLINOIS

Sales Representatives in all Principal Cities

HOW TO GET FUEL PUMP PERFORMANCE THAT CUTS MAINTENANCE COSTS



Install TUTHILL TYPE SU *Pumping Units For Dependable Service in Industrial Heating*

Tuthill Type SU multiple V-belt pumping units provide structural and performance advantages for dependable, uninterrupted operation that add up to reduced maintenance expense.

Features like these make the SU outstanding for handling heavy fuel oils in industrial heating:

- ★ **Motors up to 5 h.p. mounted on slotted slide rails for easy adjustment or replacement. No drilling or tapping required.**
- ★ **Cast iron base with mounting bolts and adjustments easily accessible.**
- ★ **One-point belt-tension adjustment.**
- ★ **Jack shaft, supported by ball-bearing pillow blocks, carries entire weight of pulley and absorbs belt tension.**
- ★ **Pump, jack shaft and pillow blocks available as separate unit.**
- ★ **Pump and jack shaft direct-connected by flexible coupling for better alignment and simplified mounting.**
- ★ **Wide range of pump models and capacities.**

Complete data is presented in Tuthill Catalog No. 107. Write for your copy today.

TUTHILL PUMP COMPANY

Dependable Pumps since 1927

939 East 95th St., Chicago 19, Illinois

Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd. Ingersoll, Ontario, Canada

dorex SNIFFS TROUBLE SNUFFS IT OUT

● A maker of fine photographic printing papers was plagued by intermittent spoilage—evidently caused by some airborne impurity too dilute to be identified by any means of analysis at hand.

Connor engineers were called in as experts on air purification. They installed Dorex test equipment to determine the nature of the impurity. Later, these test units were analyzed in the Connor laboratory—revealing the cause of spoilage as minute quantities of phosphorus originating from a smelter some miles away.

As a result of these findings, Dorex Air Recovery "C" Cells were installed in the air conditioning system—and the spoilage stopped immediately.

This is one example of how Dorex Air Recovery can purify outside air for sensitive manufacturing operations. Equally important is the positive indoor protection Dorex can provide in areas where smog is a problem.

Special cases aside, Dorex Air Recovery in any air conditioning or ventilating system will substantially reduce (1) the needed amount of outside air, (2) the needed capacity for heating and cooling, (3) installation and operating costs. Write us for full information, Connor Engineering Corporation, Dept. A-26, Danbury, Connecticut.

CONNOR ENGINEERING CORPORATION

dorex® air recovery

WE HEAR THAT

Continued

▸ *JOHN I. YELLOTT*, director of research for the Locomotive Development Committee of *BITUMINOUS COAL RESEARCH, INC.*, has been named an assistant director of *STANFORD RESEARCH INSTITUTE*. Mr. Yellott will be heading the development of the institute's solar energy research program in cooperation with the Association for Applied Solar Energy.

▸ *VIKING AIR PRODUCTS* is the new name of *VIKING AIR CONDITIONING*, a division of *NATIONAL-U. S. RADIATOR CORP.* According to the company, the new name more closely describes its manufactured line.

▸ *AIR CONDITIONING AND REFRIGERATION INSTITUTE's* exposition was the largest in its history with over 6000 pieces of equipment and parts valued at $3 million on display. It set a new all-time record for the event with 13,376 individual registrations.

▸ A new oxygen plant will be built in Calvert City, Ky., by the *AIR REDUCTION SALES CO.* Nitrogen and argon will also be produced at the plant. With completion scheduled for Spring, the plant will serve the Calvert City and lower Ohio Valley areas.

▸ *CHARLES Q. LIVINGSTON*, technical advisor to the *ARMSTRONG CORK CO.'s* insulation division, told the Thermal Insulation Society recently that trends in industry towards the use of greater extremes in temperature make it necessary to re-evaluate insulation theories. He added that improved methods for installing industrial insulation are also to be expected.

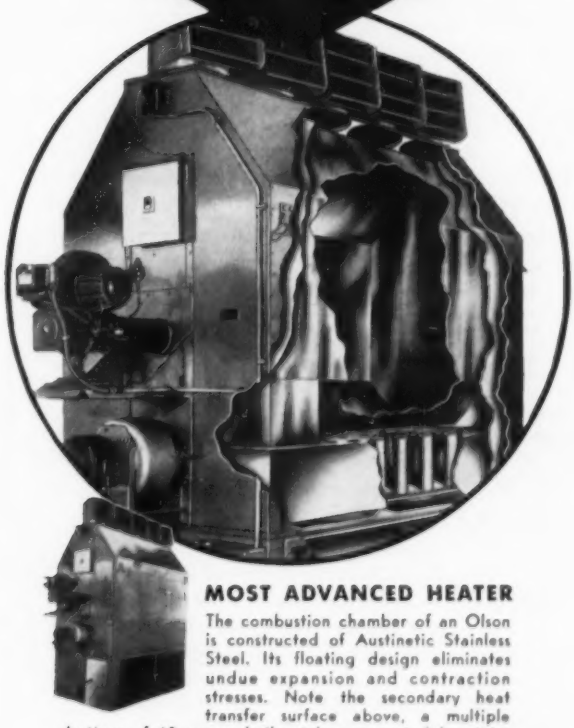
▸ Work on the *CRANE CO.* warehouse and office began recently. The structure, located in Franklin Park, Ill., will serve the Chicago area.

▸ *KOPPERS CO., INC.* is acquiring the assets of *INDUSTRIAL SOUND CONTROL, INC.* as part of its program of expansion and diversification in the metal products field.

▸ *ALLMETAL SCREW PRODUCTS CO. INC.* is sponsoring an annual award — with $1000 as first prize — in an attempt to bring more information about stainless steel to the industry. The award will be given to the author of the article of most value and interest to those who specify or buy stainless steel parts or components.

▸ *U.S. AIR CONDITIONING CORP.* has contracted to purchase all outstanding stock of *JORDON REFRIGERATOR CO.* Jordan will be operated as a usAIRco subsidiary.

STAINLESS STEEL COMBUSTION CHAMBER OF THE OLSON



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The combustion chamber of an Olson is constructed of Austinetic Stainless Steel. Its floating design eliminates undue expansion and contraction stresses. Note the secondary heat transfer surface above, a multiple battery of 10 guage boiler tubes separated by stainless steel baffles providing a four pass counterflow gas travel. The extended flue gas travel and extra heat transfer surface insures high efficiency and safe metal temperatures and long dependable heater life. Write for complete information on Olson Heaters.

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FIG. 47
"C" CLAMP WITH LOCKNUT

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WE HEAR THAT

Continued

▸ *MINNEAPOLIS-HONEYWELL REGULATOR CO.* opened the doors of a new $1 million manufacturing plant near Denver with a flash of electronic light which photographed the dedication. The new plant is for the company's Heiland Div.

▸ *COL. SIDNEY H. BINGHAM*, consulting engineer, has opened new offices at 109 E. 35th St., New York 16.

▸ *WELDALOY PRODUCTS CO.* plans to move from its present location to newly built facilities in Van Dyke, Mich. The firm's general offices will be in one building and the foundry along with the metallurgical laboratory will be in another.

▸ *FELTERS CO.* plans to spend approximately $350,000 to build a new plant and install conventional and specialized machinery.

▸ *BALDWIN-HILL CO.* has expanded its Huntington, Ind. plant to broaden its line of mineral wool insulating products.

▸ A plant is now under construction for *LIMA REGISTER CO.* The new factory will provide 72,000 ft of production area, more than double present facilities.

▸ *CARNES CORP.* has recently completed the addition of 60,000 sq ft of floor space to its plant at Verona, Wis.

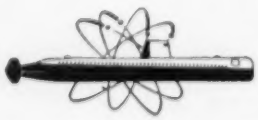
▸ *YORK CORP.* awarded its medal of merit to the 20 distributors with best overall performance records. The awards are given annually.

▸ A modernization and expansion program designed to increase valve production, cut costs and improve working conditions has been launched at *ROCKWELL MFG. CO.'s* Barberton, Ohio, division. Additional enclosed manufacturing and shipping space is being added to the 400,000 sq ft plant. Chief production alterations include foundry renovation and machine shop expansion.

▸ *PENNSYLVANIA SALT MANUFACTURING CO.* plans to enter the aerosol propellant and refrigerant fields late this year with a line of chlorofluorohydrocarbons. The line will be produced in a multi-million dollar plant already under construction at Calvert City, Ky.

MECHANICAL ENGINEERS

What Should an ME Know About Atomics?



Quite a bit these days, with so many companies getting into the field. While many new firms are now starting to explore the field, Electric Boat Division of General Dynamics Corporation led the way with the building of the first nuclear powered submarines, Nautilus and Sea Wolf.

In addition to increasing its engineering force for work on new and greatly advanced nuclear submarines, Electric Boat is expanding Research and Development operations to include the development of additional practical uses for nuclear energy.

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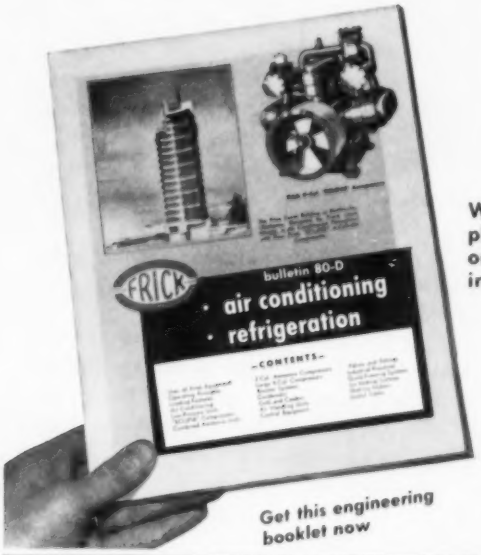

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MEETINGS & CONVENTIONS

FEB. 6-9—Fifth Annual Industrial Ventilation Conference. Kellogg Center, Michigan State University, East Lansing. Jointly sponsored by Michigan Department of Health and MSU. Michigan Department of Health, Lansing 4, Mich.

FEB. 7-9—11th Annual SPI Reinforced Plastics Division Conference. Chalfonte-Haddon Hall, Atlantic City. Society of the Plastics Industry, Inc., 67 W. 44th St., New York 36.

FEB. 15-17—Seventh Annual Corrosion Short Course for Pipeliners. Mayo Hotel, Tulsa, Okla. Sponsored by Tulsa section, National Association of Corrosion Engineers. General chairman: James C. Bell, 119 W. Eighth St., Tulsa.

MARCH 12-16—12th Annual Corrosion Conference. Hotel Statler, New York. Sponsored by National Association of Corrosion Engineers, 1061 M & M Bldg., Houston 2.

MARCH 18-21—American Society of Mechanical Engineers, spring meeting. Multnomah Hotel, Portland, Ore. ASME headquarters: 29 W. 39th St., New York.

MARCH 21-23—18th Annual American Power Conference. Hotel Sherman, Chicago. Sponsored by Illinois Institute of Technology, 35 W. 33rd St., Chicago.

MAY 7-9—Air Conditioning and Refrigeration Institute, annual meeting. The Homestead, Hot Springs, Va. George S. Jones, managing director, 1346 Connecticut Ave., N.W., Washington 6, D.C.

Week of MAY 7—American Welding Society, national Spring meeting. Buffalo. AWS headquarters: 33 W. 39th St., New York 18.

MAY 9-12—Sheet Metal Contractors' National Association, Inc., annual convention. Shoreham Hotel, Washington, D.C. J. D. Wilder, executive secretary, 170 Division St., Elgin, Ill.

MAY 14-15—Steel Boiler Institute, annual meeting. Brown Hotel, Louisville. SBI headquarters: 1308 Land Title Bldg., Philadelphia 10.

MAY 14-17—American Society of Mechanical Engineers, conference to coincide with First Design Engineering Show, Convention Hall, Philadelphia. Show sponsored by Clapp & Poliak, Inc., 341 Madison Ave., New York 17. ASME headquarters: 29 W. 39th St., New York.

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MEETINGS & CONVENTIONS

Continued

JUNE 3-6—*American Society of Refrigerating Engineers,* Summer annual meeting. Cincinnati. ASRE headquarters: 234 Fifth Ave., New York 1.

JUNE 4-7—*National District Heating Association,* 47th annual meeting. Inn and Lodge, Williamsburg, Va. John F. Collins, Jr., secretary-treasurer, NDHA, 827 N. Euclid Ave., Pittsburgh.

JUNE 25-29—*American Society for Engineering Education,* annual meeting. Iowa State College, Ames. Secretary: W. Leighton Collins, University of Illinois, Urbana.

JUNE 11-15—21*st National Oil-Heat Show.* Coliseum, New York, Managing director: R.H.L.Becker, Oil-Heat Institute of America, Inc., 500 Fifth Ave., New York 36.

JUNE 11-15—*Seventh National Plastics Exposition.* Coliseum, New York. Society of the Plastics Industry, Inc., 67 W. 44th St., New York 36.

JUNE 17-21—*American Society of Mechanical Engineers,* semi-annual meeting. Statler Hotel, Cleveland. Headquarters: 29 W. 39th St., New York 18.

JUNE 18-20—*American Society of Heating and Air-Conditioning Engineers, Inc.,* semi-annual meeting. Shoreham Hotel, Washington, D.C. ASHAE headquarters: 62 Worth St., New York 13.

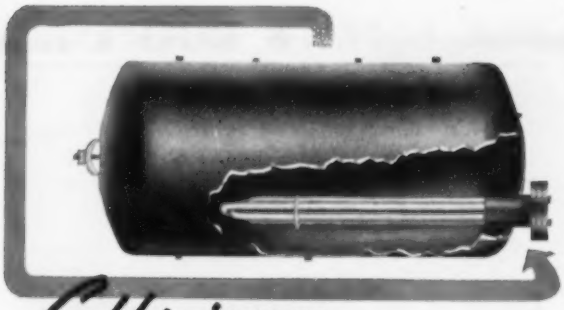
JUNE 21-23—1956 *Heat Transfer and Fluid Mechanics Institute.* Stanford University. General chairman: S.J. Kline, Mechanical Engineering Department, Stanford University, Stanford, Calif.

NOV. 25-28—*American Society of Refrigerating Engineers,* semi-annual meeting. Boston. Information: ASRE, 234 Fifth Ave., New York 1.

NOV. 25-30—*American Society of Mechanical Engineers,* annual meeting, Statler Hotel, New York. ASME headquarters: 29 W. 39th St., New York 18.

NOV. 27-30—*Ninth National Chemical Exposition.* Public Auditorium, Cleveland. Chicago Section of the American Chemical Society, 86 E. Randolph St., Chicago 1.

FEB. 25-*MAR.* 1, 1957—*International Heating & Air-Conditioning Exposition.* International Amphitheater, Chicago. Under auspices of the American Society of Heating and Air-Conditioning Engineers. Management: International Exposition Co., 480 Lexington Ave., New York 17. ∓



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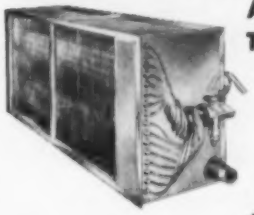

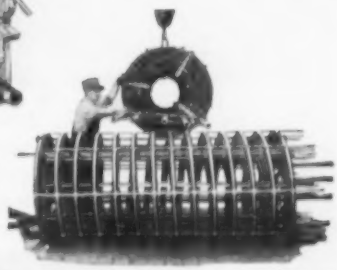

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DESIGN OF PIPING SYSTEMS—Second Ed. Written by members of the engineering departments of M. W. Kellogg Co. 365 pp. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. $15.00.

ENGINEERING DRAWING AND GEOMETRY—By Randolph P. Hoelscher and Clifford H. Springer. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. $8.00.

MODERN REFRIGERATION AND AIR CONDITIONING—By Andrew D. Althouse and Carl H. Turnquist. 756 pp. Goodheart-Willcox Co., Inc., 1321 S. Michigan Ave., Chicago 5. $7.45.

ASTM SPECIFICATIONS FOR STEEL PIPING MATERIALS—432 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $4.00.

AIR CONDITIONING IN FEDERAL BUILDINGS—Summary of Federal Construction Council technical report No. 5. Building Research Institute, 2101 Constitution Ave., Washington 25, D.C. $1.00.

ELEVATED TEMPERATURE PROPERTIES OF CARBON STEELS—ASTM special technical publication No. 180. 68 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $3.75.

BIBLIOGRAPHY ON MACHINERY FOUNDATIONS; DESIGN, CONSTRUCTION, VIBRATION ELIMINATION—ESL bibliography No. 11. Engineering Societies Library, 29 W. 39th St., New York 18. $2.00.

THE FEASIBILITY OF CENTRAL HEATING AND COOLING PLANTS UTILIZING COAL—Bulletin No. 37, Engineering Experiment Station, College of Engineering, University of Kentucky, Lexington.

RECOMMENDED PRACTICES FOR INTERRUPTION OF HEAT TREATMENT CYCLES FOR LOW CHROMIUM-MOLYBDENUM STEEL PIPING MATERIALS—American Welding Society, 33 W. 39th St., New York 18. 50c.

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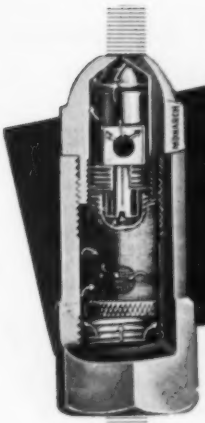

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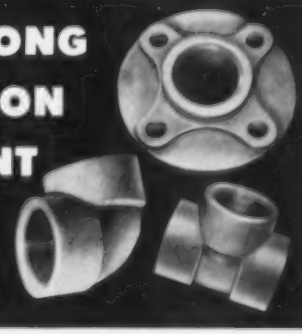

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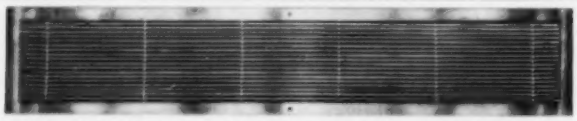
6 N. Michigan Avenue, Chicago 2, Illinois



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FOR MODERN PUBLIC BUILDINGS

Heating Engineers asked for a stronger, more durable grille — in harmony with the modern trend toward maintenance-free construction in glass, aluminum and steel. Here's our answer: a Custom-Built Heavy-Duty Bar-Type Grille that provides long-needed protection against the trouble and expense so often caused by replacement of light-gauge factory-built air-conditioning grilles. Available in any desired size or shape — all steel or all aluminum. Bulletin 43, Just off the press, gives complete information. Write for free copy.

DIAMOND MANUFACTURING CO. WYOMING (Wilkes-Barre Area) PENNA.

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A new postal regulation relating to the handling of undelivered mail may result in some issues of *Heating, Piping & Air Conditioning* being thrown away instead of being returned to us — as they have been in the past — for remailing to your new or correct address.

To avoid missing any issue of *Heating, Piping & Air Conditioning* it is more important than ever to report both your new and old address to us and your post office. Deadline is the 8th of the preceding month for the next issue. Send changes — and new local postal delivery zone — to

HEATING, PIPING & AIR CONDITIONING
6 N. Michigan Ave., CHICAGO 2, ILL.

CLASSIFIED ADVERTISING

Classified Section: Rates for classified advertising are 15 cents for each word including heading and address. One inch $7.00. Count nine words for keyed address. Minimum $2.50 for each insertion. Cash must accompany order.

miscellaneous . . .

NAMEPLATES — SPECIALLY manufactured for air conditioning and refrigeration requirements. Use these low cost 2½" x ¾" metal nameplates for labeling and identifying your installations. Over 100 standard refrigeration and air conditioning wordings available for immediate shipment. No minimum order required. Free samples, quotations. Catalog available covering metal or engraved bakelite nameplates worded as you specify. Numbered valve tag information included. SETON NAMEPLATE CO., Dept. HP-3, 394 Central Ave., New Haven 15, Conn.

miscellaneous . . .

IDENTIFICATION
NAME PLATES

For Electrical Controls, etc. Machine Engraved on black surface plastic or on black anodized hard aluminum alloy. Valve Tags, Operating Data Plates, Municipal Approved Plates, etc. Quick service by mail. Send for free sample and prices. Or send your specifications for quotation. G. F. BUNNELL CO., 34 Ocean Ave., Amityville, New York.

Manufacturers' Agents . . .

Are you interested in securing additional lines?

We are occasionally asked by our manufacturer advertisers to suggest the names of manufacturers' agents in various sections of the country whom they can contact in regard to representation of their industrial and large building heating, piping and air conditioning products.

If you would like your name listed on our records of inquiries we may receive on your territory, we invite you to write us. There is no charge in connection with this service.

HEATING, PIPING & AIR CONDITIONING, 6 North Michigan Ave., Chicago 2, Illinois

Classified Advertising

Rates of classified advertising are 15 cents for each word, including heading and address. One inch $7.00. Count nine words for keyed address. Minimum $2.50. Closing date 10th of the month preceding publication.

situations open . . .

Large Detroit Automotive Manufacturer Has A Staff Opening For Mechanical Engineer

For mechanical design including heating, ventilation, air conditioning and general industrial piping for production process work. Knowledge of paint spray booth, paint baking, oven engineering and trouble shooting would be helpful. Will involve board work and occasional travel to follow new installation acceptance and trouble correction.

Submit complete resume in first correspondence. Replies will be held confidential.

Key 1211A

Heating, Piping & Air Conditioning

6 North Michigan Ave., Chicago 2, Ill.

PLUMBING AND HEATING ESTIMATOR Excellent opportunity available for experienced estimator and engineer with an expanding mechanical contracting firm. Applicant must be fully qualified in preparing complete estimates for any industrial, commercial or government project of any size for plumbing, heating, industrial piping and utilities. Must have working knowledge of allied trades such as air conditioning, temperature controls, etc. Prefer person with at least 7 years of estimating experience. Age 30 to 50 year bracket. Person with drinking problem will not be considered. Firm is located in Santa Fe, New Mexico which is 7,000 ft. elevation. Santa Fe has excellent climate and schools. Some travel will be necessary as company concentrates on the larger contracting projects in the southwest section of the country. Salary commensurate with ability, plus other benefits. Apply in own handwriting to: L. E. Meyer Company, P. O. Box 2266, Santa Fe, New Mexico, stating qualifications and references. All replies will be kept confidential.

FIELD ENGINEER — a technical graduate or equivalent, 25 to 32 years of age with experience in refrigeration and air conditioning, required to call on contractors, wholesalers, and manufacturers in PITTSBURGH-CLEVELAND AREA. After a factory training program, very interesting work awaits you. Remuneration based on liberal salary, bonus and expenses. Write Key 1210A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

situations open . . .

MECHANICAL ENGINEER

For research design and experimental product development in thermodynamics, refrigeration and air conditioning. Experience 5 to 10 years. Send resume to Director — Borg-Warner Central Research Laboratory, 706 So. 25th Ave., Bellwood, Illinois.

TOP GRADE SALES ENGINEER

LEADING NATIONAL MANUFACTURER OF AIR CONDITIONING AND REFRIGERATION EQUIPMENT has opening on staff for experienced sales engineer to promote and sell large prestige type installations to owners, architects and contractors. Present and future growth opportunities unlimited. Chicago or midwest location. Salary and commission plan commensurate with experience and opportunities. Write complete resume of education, experience and salaries which will be treated with confidence. Personal interviews will be arranged. Reply Key 1215A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

WANTED TWO DISTRICT MANAGERS One to be located in Metropolitan New York area and one in San Francisco. To supervise Sales Offices of prominent manufacturer of Heating, Cooling and Air Conditioning equipment on East and West Coast areas. Send complete resume of education, experience, and salary requirements to Key 1213A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

PROJECT ENGINEER with proven design and development experience related to gas fired residential heating equipment for nationally known mid-west manufacturer. Must be resourceful, well informed and capable of assuming independent responsibility. Knowledge of manufacturing techniques and familiarity with A.G.A. requirements are essential. Address Key 1212A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

FIELD REPRESENTATIVE FOR HOUSTON AREA — If you are a technical graduate, 25 to 32 years of age, with experience in refrigeration and/or air conditioning, an opportunity for advancement with an outstanding and progressive company is available. After a factory training program, very interesting work awaits you calling on contractors, wholesalers and manufacturers of all types of equipment. Very liberal salary, bonus and expense allowance arrangements for an energetic sales engineer. Write Key 1209A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Illinois.

COOLING TOWER COMPANY, expanding rapidly, has unusual opportunity for man with some engineering background and with some Cooling Tower experience. Must be good administrator and organizer, capable of developing quickly into top management responsibility. Replies will be held in strict confidence. Address Key 1216A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

Design engineer with air conditioning, heating, piping systems, ME with minimum of five years experience; permanent position in expanding plant. Send complete resume to Employment Department, Abbott Laboratories, 14th St. and Sheridan Road, North Chicago, Ill.

for sale . . .

Two 60 Ton Chrysler Airtemp Water Chillers complete. May be inspected. Write or call The Barr Rubber Products Company, 1531 First Street, Sandusky, Ohio.

situations wanted . . .

AIR CONDITIONING ENGINEER, mechanical graduate, majored refrigeration, heating, ventilating. Considerable training and job experience on load determination, system design, performance analysis, service, on residential, commercial, industrial jobs for manufacturer. Know gas and steam water-absorption, air conditioners and water chillers. Experienced working with contractors, distributors, utilities, consulting engineers. Can engineer, sell, service, train, supervise. Adaptable. Can relocate quickly. Please write Key 1214A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

EXECUTIVE ENGINEER — air conditioning, refrigeration, heating and ventilating experience; in charge of successful contracting operation; capable administrator; qualified designer of commercial and industrial installations; effective sales engineer. Wants to make change for personal reasons and seeks responsible position with manufacturer or contractor, the latter with opportunity to become partner or part of firm. 40 yrs. old, married, registered mechanical engineer, author of technical articles. Address Key 1208A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

ENGINEER — 8 years' experience all phases design and construction of heating and ventilating, H.T.H.W. and steam distribution. Economic studies. Desires position with consulting engineer or engineering-contracting firm, San Francisco, Los Angeles. Available May 1st. Address Key 1217A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

lines wanted . . .

Manufacturers Agent, ME, Contacting commercial, industrial insulation contractors and sheet metal contractors in states of Texas, Oklahoma, Louisiana, Arkansas, desires additional quality lines. Address Key 1202A, Heating, Piping and Air Conditioning, 6 North Michigan Ave., Chicago 2, Illinois.

agents wanted . . .

Manufacturer's Agent required by well known manufacturer of STEAM, GAS AND OIL FIRED UNIT HEATERS, HEATING AND VENTILATING UNITS, CONVECTOR RADIATORS. Territories open in several sections of the United States. Airtherm Manufacturing Company, 711 South Spring Avenue, St. Louis 10, Missouri.

patents . . .

INVENTION RECORD and Patent Information Booklet free on request. Franklin W. Durgin, Registered Patent Agent, c/o Evergreen Farm, 12500 Meadowood Drive, Silver Spring, Maryland.

situation open . . .

MECHANICAL ENGINEERS

Tennessee Valley Authority needs mechanical engineers for maintenance and engineering staffs of new steam power plants. Interesting assignments in maintaining efficient production from pulverized fuel generating units with capacities up to 250,000 kw; steam pressures to 2000 psig; and steam temperatures to 1050° F. Large-scale operation creates opportunities for pioneering in related equipment fields.

Starting salaries for graduate mechanical engineers are $4540, $4865, and $5750 per year for a 40-hour workweek, with automatic increases for satisfactory service. Vacation, sick leave, and retirement benefits.

Interested candidates should write to Tennessee Valley Authority, Division of Personnel, Knoxville, Tennessee.

INDEX TO ADVERTISERS

Firms represented in this issue are identified by the folio of the page on which their advertising appears. Advertising which appears in other issues is marked with an asterisk.

A-J Mfg. Co. *
Acme Industries, Inc. *
Aerofin Corp. *
Air Devices, Inc. 242
Air-Factors, Inc. 213
Air-Maze Corp. *
Air & Refrigeration Corp. *
Airtemp Div., Chrysler Corp. 42
Airtherm Mfg. Co. 44
Aladdin Heating Corp. *
Alco Valve Co. 23
Allen-Bradley Co. 223
Allen Mfg. Co., W. D. *
Allen Cooler & Ventilator Inc. *
Allis-Chalmers Mfg. Co. 189
Allis Co., Louis 235
American Air Filter Co., Inc. 40, 41, 65
American Blower Corp. 50
American Brass Co., The *
American Dist. Steam Div., Adsco Industries, Inc. *
American Gilsonite Co. 51
American-Marsh Pumps, Inc. *
American Metal Hose Branch American Brass Co., The *
American Radiator & Standard Sanitary Corp., Plumbing & Heating Div. 48
Ames Iron Works 21
Ammerman Co., C. L. *
Anderson Co., V. D. *
Anemostat Corp. of America 54
Armstrong Cork Co. 18
Armstrong Machine Works 6
Auer Register Company *
Aurora Pump Co. *

Babbitt Steam Specialty Co. *
Babcock & Wilcox Co., Boiler Div. 179
Babcock & Wilcox Co., Tubular Products Div. — Fittings Dept. 55
Badger Manufacturing Co. *
Baldor Electric Co. *
Barber-Colman Co. 71
Barry Blower Co. *
Bayley Blower Co. 181
Bear Mfg. Co. *
Bell & Gossett Co. 8, 9, 68
Bethlehem Steel Company 49
B-I-F Industries Inc. *
Binks Mfg. Co. 234
Bishop & Babcock Mfg. Co. *
Black, Sivalls & Bryson, Inc. *
Blackmer Pump Co. 257
Blaw-Knox Co. 236
Boiler Engineering & Supply Co., Inc. *
Bonney Forge & Tool Works 200
Bronson Fan Company *
Brundage Co., The *
Bruner Corp., The 203
Brunner Mfg. Co. 35, 36, 37, 38
Buffalo Forge Co. 25
Buffalo Pumps, Inc., Div. of Buffalo Forge Co. 218
Builders-Providence, Inc. *
Burgess-Manning Co. *
Burnham Corporation *
Bush Mfg. Co. *
Byers Co., A. M. 4

Campbell Heating Co. *
Cam-Stat Inc. *
Capitol Mfg. & Supply Co. *
Carey Electric Engineering Co. Metal Wool Div. *
Carnes Corp. *
Carrier Corp. 60, 61
Carpenter & Paterson, Inc. 251
Carver Pump Co. 240
Cash Co., A. W. 77
Century Electric Co. 67
Chase Brass & Copper Co. 45
Chesapeake and Ohio Railway 74
Chicago Blower Corp. *
Chicago Pump Co. 237
Clarage Fan Co. Inside Back Cover
Cleaver-Brooks Co., Boiler Div. *
Cleveland Fuel Equipment Co. *
Combustion Eng., Inc. *
Committee on Steel Pipe Research American Iron & Steel Institute 197
Connor Engineering Corp. 250
Continental Air Filters, Inc. *
Cook Co., Loren *
Copeland Refrigeration Corp. 172
Cornish Rutland Co. *
Crane Co. 58
Crane Packing Company 259
Curtis Refrigeration Machine Div. of Curtis Mfg. Co. *
Cyclotherm Division National-U. S. Radiator Corp. 202

Davis Eng. Corp. *
De Bothezat Fans Division, American Machine & Metals 177
DeLaval Steam Turbine Co. 191
Delta Heating Co. *
Deming Co., The *
Detroit Controls Corp. *
Devices Inc. *
Diamond Mfg. Co. 260
Diehl Mfg. Co., Inc. 171
Dodge Mfg. Co. *
Doerr Electric Corp. *
Dollinger Corp. *
Dover Mfg. Co. 39
Dravo Corp. *
Drayer-Hanson, Inc., Subsidiary of National-U. S. Radiator Corp. 244
Dresser Mfg. Division 230
Dunham Co., C. A. 14, 15
du Pont De Nemours & Co., Inc., E. I. *
Dunkirk Radiator Corp. *
Durant Insulated Pipe *
Duriron Co., Inc., The *
Duro-Dyne Corp. *

Eagan Co., Inc., Walter H. *
Economy Pumps, Inc., Div. of C. H. Wheeler Mfg. Co. 211
Electric Boat Div., General Dynamics Corp. 252
Electro-Dynamic Div. of General Dynamics Corp. 204
Elgen Mfg. Corp. *
Elliott Company *
Elvee Company *
Evans Corp., The George 199
Everlasting Valve Co. 180

Fairbanks Co., The *
Fairmont Aluminum Co. *
Farrar & Trefts Div., Adsco Industries, Inc. *
Farr Co. 7
Fedders-Quigan Corp. *
Field Control Div., H. D. Conkey & Co. *
Finn & Co., Inc., T. R. 258
Finnigan Co., J. J. 257
Fisher Governor Co. *
Fitzgibbons Boiler Co., Inc. *
Flexaust Company 253
Flexible Tubing Corp. *
Flexonics Corp. 224
Frick Co. 253
Fulton Syphon Div., Robertshaw-Fulton Controls Co. *
Furnas Electric Co. 249

G. & O. Mfg. Co., The *
Gallaher Co., The 233
Garlock Packing Co., The 184
General Air Conditioning Corp. 248
General Blower Co. *
General Chemical Division, Allied Chemical & Dye Corp. 195
General Controls Co. 16, 17
General Electric Co. 72
General Fittings Co. 225
General Register Corp. *
Golden-Anderson Valve Specialty Co. *
Goodall Rubber Co. 198
Goodrich Chemical Co., The B. F. 20
Gordon & Piatt, Inc. *
Goulds Pumps, Inc. *
Greenlee Tool Co. *
Grinnell Co., Inc. Inside Front Cover
Gustin-Bacon Mfg. Co. 30

Halstead & Mitchell *
Handy & Harman *
Hart & Cooley Mfg. Co. 75
Hartzell Propeller Fan Co. *
Hayes Furnace Mfg. & Supply Co. *
Hays Corp., The *
Heat-X, Inc. *
Hendrick Mfg. Co. *
Henry Valve Co. *
Hoffman Specialty Mfg. Corp. *
Howell Electric Motors Co. *
Hussey & Co., C. G. *

Ilg Electric Ventilating Co. *
Illinois Engineering Co., Div. of American Air Filter Co. 40, 41, 65
Illinois Testing Laboratories 256
Independent Register Co., The 187
Industrial Sound Control, Inc. 63
Infra Insulation, Inc. 82
Ingersoll-Rand Co. 186
International Mfg. Co. *
Iron Fireman Mfg. Co., SelecTemp Division *

Jackes Evans Mfg. Co. 188
Janitrol Heating & Air Conditioning Div., Surface Combustion Corp. 208
Jenkins Bros., Inc. 174
Jenn-Air Co., Inc. *
Jewel Mfg. Co., Inc. *
Johns-Manville 28
Johnson Service Co. 62
Josam Mfg. Co. *
Joy Mfg. Co. *

Kaiser Co., E. B. *
Kathabar Div., Surface Combustion Corp. 209
Keasbey & Mattison Co. *
Keckley Co., O. C. *
Kennard Corp. 80
Kennedy Valve Mfg. Co. *
Kewanee-Ross Corp. *
Key Co. *
Kinetic Chemicals Div., du Pont De Nemours & Co. Inc., E. I. 170
Klipfel Valves Div. of Hamilton Thomas Corp. *
Kody Blower Company *
Korfund Co., Inc., The *
Kramer Trenton Co. 231
Kritzer Radiant Coils, Inc. *

Ladish Co. *
Lau Blower Co. 66
Leslie Company 33
Lewin-Mathes Company *
L. O. F. Glass Fibers Co. 79
Lima Electric Motor Co. *
Lima Register Co. 78
LimiTorque Corp. 238
Lincoln Electric Co., The *
Liquidepth Indicators, Inc. *
Lunkenheimer Co., The *

Maid-O'-Mist, Inc. *
Mammoth Furnace Company *
Marley Co., The 56, 57
Marlo Coil Co. *
Marsh Heating Equipment Co. *
Marvel Engineering Co. *
McDonnell & Miller, Inc. *
Outside Back Cover
McQuay Inc. *
Mercoid Corp., The *
Meriam Instruments Co., The *
Mid-Continent Metal Prod. Co. *
Midwest Piping Company, Inc. *
Miller Electric Mfg. Co. *
Miller Valve Co., Inc. *
Minerallac Electric Co. *
Minneapolis-Honeywell Regulator Co. 10, 11, 46, 47
Miracle Adhesives Corp. *
Modine Mfg. Co. 216
Monarch Mfg. Works, Inc. 259
Morrison Products, Inc. *
Mueller Climatrol Div. of Worthington Corp. 229
Multi-Vent Div., Pyle-National Co., The *
Murray Mfg. Co., D. J. *
Myers & Bros. Co., F. E. 34

Nash Eng. Co., The 94
National Coal Association 227
National Heater Co., The *
National Tube Div., United States Steel Corp. *
Nelson, Herman Div. of American Air Filter Co., Inc. 40, 41, 65
Nesbitt, Inc., J. J. 86, 206
New York Blower Co. *
Niagara Blower Co., The 247
Northern Indiana Brass Co. *
Novelty Steam Boiler Works, Inc. *

Ohio Brass Co. *
Ohio Injector Co., The *
Olson & Company, Arthur A. 251
Orr & Sembower, Inc. *

Palmer Thermometers, Inc. *
Paragon Electric Co. *
Patterson-Kelley Co., Inc., The 201
Peerless Electric Co., The 207
Peerless of America, Inc. *
Peden Equipment Co. *
Penn Ventilator Co. *
Petro 53
Philadelphia Gear Works, Inc. 238
Phillips Cooling Tower Co., Inc. *
Pipe Fabrication Institute, The 73
Pittsburgh Plate Glass Co., The, Fiber Glass Division 69
Porter & Co., H. W. *
Powell Valves *
Powers Regulator Co. 169
Prat-Daniel Corp. *
Preferred Utilities Mfg. Corp. *
Pritchard Co. of Calif., J. F. 210, 211

Quickdraft Company 243

R-P & C Valve Division, American Chain & Cable Co., The 226
Ramset Fastening System Winchester-Western Div., Olin Mathieson Chemical Corp. *
Randall Graphite Bearing, Inc. *
Ray Oil Burner Co. *
Raypak Co., Inc. 240
Reading Tube Corp. *
Reed Mfg. Co. *
Reflectal Corp. *
Refrigeration Engineering, Inc. *
Register & Grille Mfg. Co. *
Reliance Electric & Eng. Co. *
Remington Arms Co. 214
Rempe Co. 257
Republic Steel Corp. 215
Revere Copper & Brass, Inc. 91
Reznor Mfg. Co. *
Richmond Engineering Co., Inc. 70
Ric-wil, Inc. *
Ridge Tool Co., The 190
Rigidbilt, Inc. 258
Rite Engineering & Mfg. Corp. *
Robbins & Myers, Inc., Motor Div. *
Robert Mfg. Co. *
Roberts-Gordon Appliance Corp. *

Sall Mountain Co. *
Sarco Co., Inc. 173
Sarcotherm Controls, Inc. 43
Schaub Eng. Co., Fred H. 19
SelecTemp Div., Iron Fireman Co. *
Shaw-Perkins Mfg. Co. *
Silvercote Products, Inc. 76
Skidmore Corp. *
Skil Corp. 52
Slant-Fin Radiator Corp. *
Smith Corp., A. O., Motor Div. 221
Smith Co., Inc., H. B., The *
Spang-Chalfant Div. of The National Supply Co. 81
Spence Eng., Inc. 31
Spencer Heater, Avco Mfg. Corp. *
Sporlan Valve Co. *
Spraying Systems Co. *
Standard Stamping & Perforating Co. 245
Stedco Products Co. 254
Stephens-Adamson Mfg. Co. 205
Sterling Engrg. & Mfg. Corp. *
Sterling, Inc. 247
Stewart Mfg. Co. *
Stic-Klip Mfg. Co. 257
Stillwater Clay Products Co., The *
Stoddard Industries, Inc. *
Superior Combustion Industries, Inc. *
Surface Combustion Corp. 208, 209
Swartwout Co., The *
Synchronous Flame Inc. *

Taco Heaters, Inc. 196
Tapecoat Company, The *
Taylor Forge & Pipe Works 26, 27
Taylor Instrument Cos. 246
Titus Mfg. Corp. 29
Titusville Iron Works Co. The Div. of Struthers Wells Corp. *
Toledo Pipe Threading Machine Co. 194
Torit Mfg. Co. *
Trane Co., The *
Trion, Inc. *
Tube Turns, Inc. *
Tube Turns Plastics, Inc. 259
Tuthill Pump Co. 249
Tuttle & Bailey, Inc. *

Union Asbestos & Rubber Co. *
Union Malleable Mfg. Co. *
Unistrut Products Co. *
United Cork Companies 222
United States Air Conditioning Corp. 3
United States Rubber Co. 183
United States Steel Corp. *
United Wire & Supply Corp. 228
Universal Diffuser Corp. *
Utility Appliance Corp. *
Utility Fan Corp. 59, 93, 185

Van Dorn Iron Works Co. 241
Velocity Power Tool Co. *
Vilter Mfg. Co., The 232

Wagner Electric Corp. 64
Waldron Corp., John *
Walker Mfg. & Sales Corp. *
Walworth Co. 24
Waterloo Register Co. *
Watson-Stillman Fittings Div., H. K. Porter Co., Inc. 212
Watts Regulator Co. *
Webster & Co., Warren 85
Webster Engineering Co., The *
Weil-McLain Co. 219
Weil Pump Co. *
Weinman Pump Mfg. Co. 192
Weirton Steel Co. *
Western Eng. & Mfg. Co. *
Westinghouse Elect. Corp., Air Conditioning Div. *
Westinghouse Elect. Corp., Sturtevant Div. 220
Wheatland Tube Co. *
Wheelco Instruments Div., Barber-Colman Co. *
Wheeler Mfg. Co., C. H. 211
Wheeling Corrugating Co. *
Wheeling Steel Corp. *
Whitlock Mfg. Co., The *
Will-Burt Company, The *
Wilson Engineering Corp. 260
Wilson Inc., Grant *
Wing Mfg. Co., L. J. 182
Wiremold Co., The *
Wolverine Tube Div. of Calumet & Hecla, Inc. 32
Worthington Corp. *

Yamall-Waring Co. 193
York Corporation 12, 13
York-Shipley, Inc. *
Young Radiator Co. *
Youngstown Sheet & Tube Co. 22

Zallea Bros. 92
Zink Co., John *

ARCHITECTS AND ENGINEERS: Ellerbe & Company, St. Paul, Minnesota.
GENERAL CONTRACTORS: O. W. Burke Company, Detroit, Michigan.
MECHANICAL CONTRACTORS: Johnson-Larsen & Company, Detroit, Michigan.

COMFORTING

The Clarage fans above, located on the top floor, were sized to also take in stride the ventilation requirements of an additional five stories planned as a later expansion. In all, 17 Clarage Type NH fans, five Ready Units, a Unicoil sprayed coil unit, two Unitherm fan units, and five Propeller fans serve this hospital.

to patients and management alike

. . . CLARAGE Air Handling Equipment serving the new William Beaumont Hospital at Royal Oak, Michigan

PATIENTS in this new 236-bed hospital are safeguarded by properly conditioned air handled quietly by Clarage fans and units.

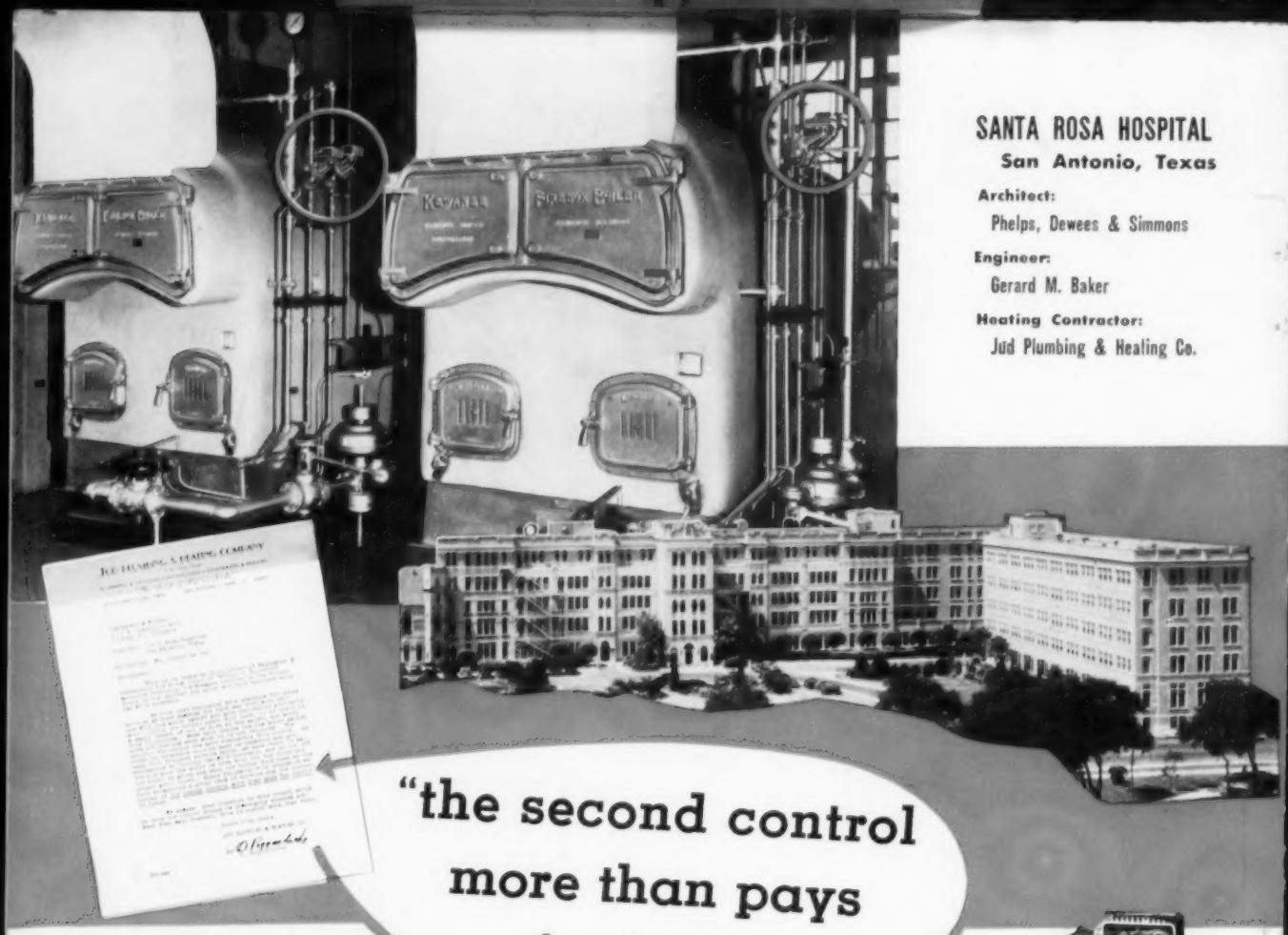
MANAGEMENT for this hospital, operated on a non-profit basis by the South Oakland Hospital Authority, knows that Clarage quality can be counted on to provide successful, economical operation for a long time to come.

If faithful performance and operating economy are what YOU'RE after, we have the answer. Clarage specializes — builds air handling and conditioning equipment exclusively. Call us in for capable assistance on your next requirements. CLARAGE FAN COMPANY, Kalamazoo, Michigan.

CLARAGE

. . . dependable equipment for making air your servant

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal



SANTA ROSA HOSPITAL
San Antonio, Texas

Architect:
Phelps, Dewees & Simmons

Engineer:
Gerard M. Baker

Heating Contractor:
Jud Plumbing & Heating Co.

"the second control more than pays for itself"

HERE you see the utmost in boiler water level control keeping excellent company. Those No. 150 Pump Controllers and Low Water Cut-offs are installed on two large modern Kewanee firebox boilers in the boiler room of a big new addition to San Antonio's already large and famous Santa Rosa Hospital.

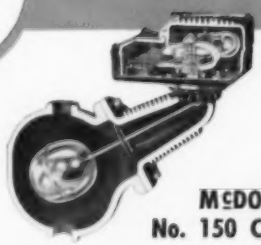
The men and firms who turned out this commendable job are listed above. An interesting aspect of the engineering is the use of two McDonnell No. 150 Controls on each boiler; one positioned higher than the other; the upper control used solely to control the feed pump; the lower, solely as a low water cut-off to stop the gas burner.

In a letter from the heating contractor, the reason for this arrangement was given: When the controls were installed, it was decided that local conditions would produce considerable fluctuatiors in the boiler water level which would often cause the low water cut-off switch to stop the burner when there was no actual condition to warrant cutting off. By setting the low water cut-off so that it will stop the burner only when there is a serious low water condition, unnecessary service calls are avoided. As a result, says the letter, "the second control more than pays for itself."

The resourcefulness to meet special conditions in a practical way is characteristic of men who know their heating and equipment. So it is not surprising to find McDonnell equipment in so many of these well engineered, capably-executed installations.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

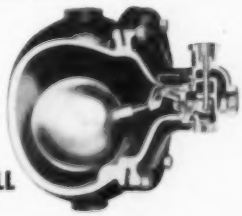
Doing One Thing Well



McDONNELL
No. 150 Control

Maximum Steam Pressure, 150 lbs.
Underwriters' Approved

Holds boiler water level within the close limits that assure maximum steaming efficiency and fuel economy. Ask for complete set of installation and wiring diagrams covering both single and battery boiler jobs.



McDONNELL
No. 27

Make-up Water Feeder

An excellent team-mate for the No. 150, this McDonnell make-up water feeder is mounted on the receiving tank to maintain a minimum water level at all times.

Your Jobber Stocks Them

McDONNELL *Boiler Water Level Controls*